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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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The Problem of Acid Resistance

IN the earlier stages of its history, the chemical industry was content to construct both plant and buildings of such commonplace materials as iron, copper, lead, and wood. There is little question that at that time these materials served their purpose sufficiently well to enable the processes to be carried out with considerable profit. During the last decade, however, standards have undergone a considerable change, the high cost of all materials has precluded their renewal at comparatively frequent intervals, the rate of production has increased, and mechanical devices are being rapidly introduced for a host of operations formerly conducted by manual labour. Apart from these considerations, the degree of purity now expected of chemical products is far higher than hitherto, so that the manufacturer of plant materials has not only to consider the question of durability under all manner of conditions, but he must ensure that any new substance or combination of substances which he introduces into his material will not influence the composition of the product. The ideal material in the construction of apparatus for chemical operations should have the same composition as the materials undergoing treatment, but in nearly all cases physical and mechanical properties definitely preclude such a course. Thanks to the chemical engineer, the selection of materials available for almost any given set of conditions is

now surprisingly diverse, and although there are problems still awaiting solution, the chemical works to-day is in an unusually fortunate position from the point of view of its equipment. This progress has largely been rendered possible by the frank exchange of views between the producer and the user of plant; by the admission on the one hand of inherent difficulties and by a determination on the other to overcome them. This increasing co-operation between the two interests has become an established rule, and it is only by the development of such collective investigations that the progress already registered can continue.

In this issue of THE CHEMICAL AGE will be found articles and notes dealing with modern acid-resisting materials and their use in the chemical and allied industries. Mr. S. J. Tungay, whose work in connection with such metals has placed him in the front rank of authorities on the subject, raises the complex question as to whether the properties which are most sought after are better obtained by striving after extreme purity or by the addition of desirable constituents. Some few years ago it was generally believed that acid-resistant properties were most likely to be found in a very pure unalloyed metal; to-day metallurgical chemists are engaged in replacing some of the so-called impurities that were formerly condemned and summarily removed. This may be said to represent the stage at which our knowledge of the subject has arrived to-day, and there is yet much fascinating research to be followed in connection with the exact part played by the different constituents and their incorporation in the final product.

In dealing with the non-metallic substances that find a use in chemical plant construction, Mr. Leonard Carpenter draws attention to the great number of such acid-resisting materials now available. He emphasises the great variety in their character, so that judicious selection on the part of the user is essential. There still remain a number of industrial processes that can only be carried out in vessels constructed from non-metallic substances, while for constructional purposes in corrosive atmospheres similar materials have proved of great value.

The large-scale manipulation of mineral acids raises a number of problems closely related to those already discussed. This matter has been dealt with in detail by Mr. F. Hirsch in his book on *The Transport and Handling of Mineral Acids*, published by Ernest Benn, Ltd., in The Chemical Engineering Library. We reproduce some of the points made in the book in regard to handling, storage, and transport. This country has long been to the fore in the production of acids, and Mr. Hirsch's book should do a valuable service in focussing attention on a point of great industrial importance.

The display at the recent Chemical Plant Exhibition showed that in regard to corrosion-resisting materials

and plant, British manufacturers are in a very advanced position. Considerable attention is given in the present number to products of this nature now on the market, the number and variety of which indicate the remarkable progress recently made in this field.

The Atmospheric Nitrogen Industry

WHEN Dr. Bruno Waeser, in the year before the war, undertook to prepare a volume on the atmospheric nitrogen industry for Professor Fischer's chemical technology series in German, he had, of course, no idea of the enormous developments that were to follow the outbreak of war. The result was a very much larger work than was originally contemplated. This has now been published in English in two volumes under the title of "The Atmospheric Nitrogen Industry, with special consideration of the production of ammonia and nitric acid" (J. and A. Churchill, pp. 746, 42s.). It has been translated by Dr. Ernest Fyleman (chief chemist to J. F. Crowley and Partners), and a foreword has been added by Dr. J. F. Crowley (with whom the late Dr. Harker was associated) which deals with some of the developments that have occurred since the original volume was written. The first volume contains the introduction (in which the historical developments of the nitrogen industry prior to the direct fixation of nitrogen are reviewed) and deals with the historical and economic aspects of the subject; the second volume is devoted to the technical side and describes in detail the principal processes.

It was a great idea to give the world a standard book on a world subject, and some enterprise was needed to undertake an English edition. But the difficulty with so wide and rapidly developing an industry is to collect the essential facts rapidly enough to publish them before later developments have left them out of date. There is, of course, in these two volumes, an immense amount of information patiently collected together, and still possessing a certain historical and scientific value, but anyone expecting to find the position of the nitrogen industry described as it exists in 1926 would be grievously disappointed. The period covered by the original work appears to be from about 1913 to 1921, and an attempt has been made to carry on the story up to 1924 by adding a few notes, in the form of a "supplement," to each chapter. The device cannot be described as a success. The translator has not attempted to revise the matter, being content to confine himself to his task of translation, which has been well done, but on one page alone (216) he has felt obliged to add three footnotes correcting or supplementing the author's statements on matters of fact within his own knowledge.

It would require a very industrious student to say how far, in every country interested in nitrogen fixation, the present work indicates current conditions, but we can speak with some knowledge of the British position and also of the American. THE CHEMICAL AGE was already in existence when the Nitrogen Products Report made its appearance, and from then until now it has published more first-hand information on nitrogen developments in this country and in the United States than probably any other journal. In addition, in its Annual Review Number for years past, Dr. E. B.

Maxted, whom Dr. Waeser recognises as one of the acknowledged authorities on the subject, has presented our readers with a careful survey of any developments of serious interest. In the bibliography attached to Dr. Waeser's work, we can find no mention of the Nitrogen Products Report, though admittedly a work of the highest historical and technical importance, and the summary of the "most important periodical literature" relating to the British nitrogen industry consists of the principal German journals, and two English journals—one chemical and one engineering. In the general index to the work the Nitrogen Products Report appears once, and on looking up the reference (p. 196) it appears to be based on notices in current publications and indicates no direct acquaintance with the report itself. Similarly, with the report of the Commission on the German Chemical Industry and with the reports on the American position. In short, the facts, especially in reference to the history and economics of the subject, appear to have been laboriously collected from technical and trade journals, mainly German.

We have read with some care the chapter on "The British Nitrogen Industry," and can only suggest that a large part of it ought to have been rewritten or scrapped. The statistics of ammonia production end with 1919, the export prices of 1920 and 1921 are of little interest to-day, and one hardly knows what to think of the sentence, "there has recently been an increasing demand in England for a prohibition of export of fertilisers." Even in the supplementary notes, intended to put the reader right, we read with some surprise that "in this country the main feature remains as hitherto the production of by-product ammonia from the distillation of coal" and "the production of synthetic ammonia is at the moment still unimportant"; the Billingham works, we are told, are "expected to commence production in 1923-24"; and there are references to the Cumberland Coal Power and Chemical Co. and other concerns which need to be supplemented. Dr. Crowley's "foreword" does, indeed, indicate partly how far events have travelled in this country since, but a comparatively short essay cannot make up for the obsolescence of so much of the other matter, nor will everyone be prepared to accept his confident statement that "the most outstanding development of recent years is that of the Casale synthetic ammonia process."

The Chemical Attitude to War

QUESTIONS of the relationship of war and peace have been much to the fore lately. Professor Fritz Haber, in a recent speech, has indicated that German chemical industrialists would welcome the abolition of gas warfare. Considering how closely the professor was connected with the use of poison gas by the Germans in the war, some people may be inclined to scoff at the views now expressed by him. It is only fair to draw attention to the other aspect of his work—namely, the synthesis of nitrogen compounds from the air, for which he very properly received a Nobel Prize. This work has led to such an advance in the use of artificial fertilisers that for this facet of his character, at any rate, posterity will owe him its gratitude. We draw attention to these two mani-

festations of one man's activities in order to show how closely connected, even in the mind of a single human being, are the ideas of war and peace.

Yet another instance of this connection is to be found in the recent absorption, by the I. G. Farbenindustrie A.-G., of the Köln-Rottweil explosives company among others. The company in question, in pursuance of its policy for some time past, will develop the manufacture of artificial silk and presumably decrease its production of explosives. While the cellulose derivatives used for explosive purposes differ in some cases from those used for textile purposes, yet the knowledge and experience amassed by the explosive manufacturers is likely to be of great importance in the general technology of cellulose derivatives; while the combination in the I.G. of these technologists of varying interests may lead to results of great importance in the textile world. The absorption of this and kindred companies by the I. G. has, however, another aspect of great interest, for it may be interpreted by some as strengthening Germany's power of making war by giving her yet another flourishing peace-time industry which can, like the dyestuffs industry, be instantaneously converted if necessary to a weapon of offence.

On the political implications of this matter we refrain from comment, but its general bearings deserve attention. In the present state of things it is to be presumed that the preparation of war products is carried out in peace time on such a basis that it can be greatly extended at short notice. If the industries manufacturing cellulose fibres and other cellulose products were in a position to convert their plant rapidly to the manufacture of nitrocellulose explosives, then a nation whose artificial silk, dyestuff, and synthetic nitrogen industries were in a flourishing condition would be armed to the teeth. At the same time, it would not have an unnecessarily large proportion of its population engaged in peace-time in the preparation of war materials, and what is perhaps more important, there would be fewer people and industries than at present directly dependent on war for their prosperity. Possibly a pure pacifist would regard the position as immoral, but it seems at least one stage in advance of the present state of things. The final touch to these considerations is added by the recent speech of Sir James Irvine in America, in which he pointed out that even if the whole machinery of war were scrapped, the chemical factory, which is indispensable in peace time, would still remain as a potential arsenal.

The New Fuel and Power Committee

THE President of the Board of Trade, in deciding to appoint a National Fuel and Power Committee, is carrying out a sensible recommendation of the Coal Commission, and has brought together a representative body of experts whose advice cannot but be of great advantage to the nation. At the same time, it is unreasonable to expect that the most competent of advisory bodies is likely to produce any immediate effect on the fuel problem and the coal situation generally in this country. The work of the Committee is "to consider and advise upon questions connected with the economic use of fuels and their conversion

into various forms of energy, having regard to national and industrial requirements and in the light of technical developments." The members are Sir Alfred Mond, M.P. (chairman), Mr. J. Baker, M.P., Mr. Mark Brand, Sir John Cadman, Sir Arthur Duckham, Sir William Hart, Mr. Frank Hodges, Professor F. A. Lindemann, Sir David R. Llewellyn, Mr. M. Mannaberg, Mr. C. H. Merz, Sir Alexander Walker, and Mr. D. Milne Watson. The secretary of the Committee is Mr. W. Palmer, and the assistant secretary Mr. R. J. Moffatt. All communications should be addressed to The Secretary, National Fuel and Power Committee, Board of Trade, Great George Street, London, S.W.1.

It is an acknowledgment of the close connection between chemistry and the fuel situation that the industry should be so strongly represented on the new Committee. The appointment of Sir Alfred Mond as chairman will be universally approved; no one is better qualified to get the Committee working on definite and practical lines. Sir John Cadman, a recognised authority on liquid fuels, is technical adviser to the Anglo-Persian Oil Co. and a member of the Council of Scientific and Industrial Research; Sir Arthur Duckham holds a high position as an authority on furnace work, coal carbonization and engineering connected with chemical developments, and has lately come into more intimate contact with directly chemical interests; Professor F. A. Lindemann is Professor of Experimental Philosophy at Oxford, and was director of the Physical Laboratory of the R.A.F. at Farnborough during the war; Mr. D. Milne Watson, as governor of the Gas Light and Coke Co., chairman of the British Sulphate of Ammonia Federation, and in other capacities, is in very close touch with the heavy chemical industry. Something at least has been gained by the general conviction that if this fuel problem is to be solved, it can only be by the application of the best scientific knowledge and scientific methods.

From the general point of view, the week's events have disappointed the hopes of a settlement that the movement to resume negotiations raised. The negotiations have not been renewed, and the Government adhere to their passive policy of non-interference while the dispute drifts on. Men are gradually returning to the mines, and in the circumstances it seems possible that the strike will ultimately peter out, though, in view of the stubborn character of the miners' attitude, this result may not be reached for some time yet. In the meantime, on the eve of his departure for Southampton, Sir Alfred Mond has rather startled some who have been vaguely demanding increased production from the pits by the statement that what the industry is suffering from is over-production, to the extent of at least 15 per cent., and that the economic situation will not be corrected until production and consumption are brought into accord.

The Calendar

Aug 31 to Sept 12	World Power Conference.	Basle, Switzerland.
Sept 1 to 4	Institute of Metals : Autumn meeting.	Liège, Belgium.
6 to 11	American Chemical Society : 50th Anniversary.	Philadelphia, Pennsylvania.

Acid-Resisting Metals for Chemical Plant

By Sydney J. Tungay

How can we best produce our acid-resisting metals? Will it be by artlessly refining or artfully alloying? There is to-day much controversy as to whether we should seek perfect purity, or crafty combination of metals. Possibly at no time in the progress of industrial chemistry has greater attention been directed to the subject of metals for withstanding corrosion and for resisting acids than at the present.

On all sides the industrialist and the chemical manufacturer are calling out for metals and for plant of metallic construction which can be guaranteed to resist the corrosive action of acids and alkalis. Anyone who attended the overcrowded symposium on the subject of "Corrosion of Metals," which was held in London in connection with the recent Congress of Chemists, must have been very forcibly impressed with the serious desire on the part of chemists and chemical manufacturers to probe to the fullest possible extent all available results of research regarding the resistance of metals to acid corrosion.

The Demand for Alloys

It is a somewhat noteworthy fact that many of the earlier conceived impressions regarding the necessity of producing a very pure unalloyed metal for ensuring acid resistance have latterly received a somewhat severe shock. Metallurgical science seems now to be occupied in the combining of alloys, and in this way introducing into the final alloy even some of the foreign elements which formerly refiners and metal mixers sought to extract in order to secure absolute purity of the finished metal.

This is particularly noticeable in the case of iron and steel alloys, since there was at one period great hopes that a chemically pure iron free from all the foreign elements which nature has added to the metal would have valuable non-corrosive and acid-resistant qualities. The production of electrolytic iron and pure iron has convinced us that the reverse is the case. Metallurgists are now actively engaged in replacing in iron and steel the silicon, chromium, tungsten, manganese, nickel and some other elements which nature originally incorporated with the metal.

It is the province of metallurgical science so to regulate the percentage of these additions to the alloy, and so carefully to eliminate the known deleterious factors, as to produce the maximum resistance to corrosion in the finished product; and this is the critical point to which the metallurgy of acid-resisting metals has to-day arrived.

After having very carefully ascertained what are the fundamental principles of corrosion, which have been very usefully classified under the headings of acid corrosion, electrolytic corrosion and colloidal corrosion, research has been undertaken to combat the action resultant from each or all of these theories, and the combining of alloys destined to attain this object has proved in many cases a very fascinating line of research.

Whilst, generally speaking, it is correct that pure metals suffer corrosion more slowly than commercial metals, it has been determined that little hope could be entertained of producing a really satisfactory acid-resisting metal simply by removing the impurities. A far more satisfactory method has been found by the addition of desirable constituents than the removal simply of the undesirable.

It is in this way that the addition of a high percentage of silicon to iron has given us the well-known acid-resistant irons which are resistant to dilute sulphuric acid and nitric acid, even though these acids may be at boiling temperature. Some infinitesimal action does undoubtedly take place at the moment of contact, but a film of silica, which is almost instantly produced on the surface of the metal prevents further attack.

In the case of aluminium, which has remarkable resistant properties to some of the organic acids, it is usually found that a definite projecting film of oxide forms upon the surface of the metal exposed to the acid action; and it is this film that actually protects the metal itself from corrosion.

A similar condition exists in the case of the extremely high resistance of lead to sulphuric acid. A film of lead sulphate rapidly forms upon the surface of the lead, this acting as a protective film and preventing further corrosion of the metal.

Steels for Chemical Plant

In the production of an acid-resisting steel suitable for use in the construction of chemical plant, steels more recently produced contain the addition of 12 per cent. to 14 per cent. of chromium; and it is this chromium addition, coupled with a suitable carbon content of, say, .25 per cent. to .3 per cent., which gives the excellent results obtained by the stainless iron and steel so well known.

One of the methods of producing mild stainless steel is that known as the Hamilton-Evans process; the metal being produced by melting steel scrap in the usual way in an electric furnace such as the Heroult furnace, the slag being poured off, and a slag known as the receptive slag being introduced on to the bath of molten metal. When this slag is in a suitable condition, chrome ore intimately mixed with ferro-silicon is thrown on to this slag. The entire body of the ore with all its refractory components is fused, and the chromium oxide, iron oxide, and manganese oxide are reduced by the action of the silicon in the ferro-silicon. The chromium and other metals so formed descend into the molten metal, whilst the other components of the ore are retained in the slag. The silica resulting from the oxidation of the silicon combines with the lime in the slag, and the basic lining is thus protected from excessive corrosion, whilst the resulting slag, after reduction has taken place, acts as a refining agent for the molten metal.

To produce the desired results in this way, the chrome ore has to be as rich as possible in chromic oxide and iron oxide. The ferro silicon should also be rich in silicon and free from carbon to produce a mild stainless steel.

The mild stainless steel when finished is a steel containing about 11 per cent. to 14 per cent. chromium with .1 per cent. carbon or less. The remaining constituents, such as silicon, sulphur, phosphorus, and manganese, are all more or less in normal percentages.

Although a steel made in this alloy would be considerably attacked by 15 per cent. boiling sulphuric acid, yet it stands up very well indeed to the action of 15 per cent. boiling nitric acid. Even better acid-resisting properties are obtained from a steel described by Dr. W. H. Hatfield as a chromium-nickel acid-resisting steel containing approximately 18 per cent. of chromium and 8 per cent. of nickel. For commercial acids this chromium nickel steel is found to be reliably resistant to nitric acid of 1.20 to 1.42 specific gravity; also for mixed acids for nitration purposes. There is some action from sulphuric acid, although it appears to resist somewhat better than the straight chromium steel.

These chromium-nickel steels have undoubtedly a very wide industrial application in connection with the chemical industry, and it would seem that it is in the direction of these ternary alloys that chemical engineers will in future discover their best acid-resisting steels, both for organic and inorganic acids. It cannot be doubted that we are on the eve of very far-reaching advances in the field of acid-resistant steel.

Acid-Resisting Lead

Before closing this article, a word must be said with regard to acid-resisting lead, commonly designated chemical lead. Here, again, the question of purity has latterly been very actively discussed. Lead for withstanding sulphuric acid, it has been claimed, should always be 99.99 per cent purity; and many lead manufacturers are prepared to guarantee a lead of this purity. Whilst it would seem that this gives us a pure lead and often a lead of high flash test and one that should resist sulphuric acid for prolonged use, it is on the other hand particularly soft, and is liable to creep as a result of expansion. Even this lead, however, from time to time fails the industrialist and the sulphuric acid manufacturer. Tests and assays are made, and the lead is proved to be 99.99 per cent. or thereabouts, but yet is unsatisfactory.

It, of course, remains to be ascertained what the 'or' impurities consist of, and whether the lead content is entirely metallic lead or whether any lead oxides are present with the metal. Chemical lead which has been in long-continued use for many years in the lead chamber process has been tested

and found to contain traces of copper. The copper certainly gives the lead a higher flash test than in the case of the purer lead; it also hardens the metal, enabling it better to withstand temperature variations; and some of these coppery leads have been found to stand up against acid action for years without undue corrosion.

This factor has provoked a controversy which is now going on among metallurgists, lead manufacturers, and chemical engineers; and the satisfactory standardisation of acid-resisting lead or chemical lead will undoubtedly soon be forthcoming. To this end a very considerable amount of investigation into the behaviour of chemical leads of varying analyses has been undertaken. Here, again it may yet be proved that for acid resistance an absolutely pure lead will not necessarily be found to be the best, but even added copper may prove an advantage rather than otherwise.

Non-Metallic Acid-Resisting Materials

By Leonard Carpenter, B.Sc., A.I.C.

DURING recent years much has been written and considerable research done upon acid-resisting metals and their use in the chemical and allied industries. Although the scope for these has been considerably widened, there still remain many technical reactions which can only be carried out in vessels constructed of non-metallic materials. These materials vary enormously in character according to the conditions, such as temperature, concentration, etc., which they are called upon to withstand.

This article is confined to materials resistant especially to acids, and a moment's consideration will show that the choice of such materials will depend not only on what acids they will be called upon to resist and their temperature and concentration, but also upon the size and shape of the vessel or other article, what stresses it will be called upon to resist, and whether these stresses are dynamic or static. Last, but by no means least, there arises the question of cost, by which is meant the cost for repairs and renewals per unit of output, which must constantly be borne in mind if maximum economy is to be obtained.

Conditions of Resistance

Resistance to acid (as indeed to any other chemical agent), is a function both of physical structure and chemical composition. In order to obtain maximum resistance it is desirable for the material, however inert chemically it may be, to present a minimum surface to the acid; and for this reason it should be of a close, homogeneous, and non-porous character. This condition may be modified where other circumstances, such as resistance to sudden changes of temperature may be involved, in which case a compromise must be struck between a porosity sufficient to prevent fracture but insufficient to cause disintegration. Where no such compromise is permissible a material of a non-porous character but with a minimum thermal coefficient of expansion must be used.

The case also arises where porosity is a *sine qua non* for the particular use involved; for example in the case of a porous filter plate, or support for catalytic material. In this case material sufficiently resistant to give good service in spite of the abnormal surface exposed is called for.

Silica

From the point of view of resistance to acids of all kinds and concentrations, both hot and cold, silica, by virtue of its chemical inertness, stands in a class by itself. Fused silica made from pure quartz sand has found great application during the last 15-20 years in the acid manufacturing industry as material for stills, condenser coils and pipes, cascade concentrator basins, etc., under the trade name of "Vitresil." It is made by fusing quartz sand in the electric furnace; softening takes place over a wide range of temperature from 1,100°-1,200° C, when rigidity begins to diminish, up to about 1,800° C, when it flows like a liquid. At 1,650° C. it may be blown and moulded.

Owing to the high viscosity, numerous minute bubbles of gas become imprisoned in the mass, giving it a white translucent appearance when cold, but this is not detrimental for most purposes. By fusing in vacuo, a clear glass can

be produced, but as the process is much more expensive it is only employed for purposes where transparency is essential; these do not come within the scope of this article.

Fused silica is chemically inert, perfectly vitreous (*i.e.*, amorphous) and non-absorbent. It resists all acids, both hot and cold, concentrated and dilute (with the exception of hydrofluoric and hot concentrated phosphoric), for an indefinite period of time, without disintegrating. Owing to its extremely low thermal coefficient of expansion* it may be heated and cooled very rapidly without fracture, and for this reason is ideal for condenser pipes cooled by immersion or by a stream of cold water, acid coolers and stills. It is also light in weight (density 2.21).

It is to be hoped that much more attention will be directed in the near future to research work on acid-resisting lead in this country.

The only points not in its favour are: its first cost, although in many cases the actual cost per unit of product is less than with some less expensive materials; its fragility, which necessitates very careful handling and provision of ample support in construction to avoid strain; and its tendency to devitrify when exposed to temperatures above 1,000° C. for prolonged periods. This tendency may be observed in laboratory ware which has been in use for any period of time; in this instance slight devitrification is of little moment, but for plant in continuous use for weeks or months at a time would be a serious factor. The devitrification is due to the amorphous silica reverting to the stable crystalline modification of Cristobalite; unlike the amorphous modification the latter is extremely sensitive to temperature change at 230°-250° C. owing to the large volume change from the α to the β form.

The use of silica in combination with other substances lowers its resistance to acid to some extent but overcomes some of the above disadvantages, especially that of brittleness and cost. In combination with bases such as lime, potash, soda, zinc oxide, and alumina, it is possible to produce a glass containing as much as 80 per cent. silica. Such a glass is highly resistant both to acids and to sudden temperature changes, and these properties may be further enhanced by the addition of boric oxide (B_2O_3) up to 11-12 per cent.

Such a glass, containing as it does up to 92 per cent. of acidic oxides, would be expected to be highly resistant to acids, and this expectation is borne out in practice; it also possesses a very low thermal coefficient of expansion and certain other properties which, however, do not call for description here.

Acid-Proof Clay Products

For the linings and packings of Glover and Gay-Lussac towers, hydrochloric and nitric acid recovery towers, mains, tanks and transport jars, acid-proof bricks and stoneware are employed. These are clay products, mixtures of complex aluminosilicates containing a high percentage (60-80 per cent.) of silica. Acid-proof bricks and tower packings are usually made from mixtures of naturally occurring clays, weathered, intimately mixed and aged. After being moulded and dried the products are fired in kilns, usually of the round down-draught or "beehive" pattern, up to the point of

* 0.00000059 c.g.s. units (0°-1,000° C.).

complete vitrefication, whereby the fluxes such as lime, magnesia, potash and soda unite with the silica and alumina to form a dense, glassy matrix, which binds together the coarser particles to form a dense body containing only a few sealed pores.

This body presents a minimum of surface to the acids in contact with it, and such action as does take place is only on the surface. Being very slight, the body simply slowly diminishes in size without disintegration such as would take place in a porous body, into which the acid could penetrate.

A minimum of bases is essential to confer acid-resisting properties, and in order to bring about complete vitrefication fairly fine grinding and intimate mixing of the raw materials are important in order to obtain intimate contact of all the particles. This is followed by firing in the kiln to a high temperature (1,400° C.), after which the fire is held for a sufficient period to insure complete vitrefication. A typical analysis of a brick is given below:—

	Per cent.
Silica	79.9
Alumina	15.7
Iron oxide	2.6
Lime	0.9
Magnesia	0.4
Loss on ignition	0.5

Essential Factor in Clays

The essential factor in clays used in the manufacture of acid-proof ware is a wide range of temperature between complete vitrefication and actual softening. This range should be as wide as possible and in most cases is not less than 200° C., in order to avoid too great a percentage of warped and spoilt ware. Thus, where the firing temperature is 1,400° C. the softening point should not be less than 1,600° C. (Seger Cone No. 27). Owing to the difference in temperature between the top and the bottom of the down-draught kiln, it is usual to burn the vitrefied goods in the higher courses so that they may be subjected to as even a temperature as possible and not have to suffer a load which might cause them to bulge or squat. Rigidity under load at high temperatures improves with increasing silica content, and for this reason a high percentage of this constituent increases the vitrefication range as well as improving the acid resisting qualities.

Good vitrefying clays occur in the Buckley district of Flintshire in North Wales, around Accrington in Lancashire, and also in the Midlands and in Devonshire.

The Buckley blue fireclays are eminently suitable for acid-proof ware. For vitrefied bricks the fireclay is finely ground and intimately mixed with a less refractory and more ferruginous clay, and the mix, after wetting to a stiff plastic consistency and ageing for a suitable period, is moulded into shapes and burned in down-draught kilns to 1,380°-1,400° C. A further period of soaking is then given, during which reducing conditions are maintained in the kiln to reduce the iron oxide to the ferrous condition in which it unites with the silica, to form a complex silicate giving the goods a dark blue or purplish colour.

These goods are known by various names such as Flintic, Metalline, Obsidianite, etc. When broken they show a vitreous surface containing numerous small fragments of silica embedded therein; a drop of red ink thrown upon the broken surface is not absorbed but remains there and dries; this constitutes a good test of vitrefication.

The bricks are fireproof as well as acid-proof and are therefore suitable for such purposes as lining the burner pipes leading from burner stalk to Glover tower, and for Gaillard and Kessler concentration plants.

The straight fireclays obtained from the Buckley seam are resistant to acid gases and have been found highly satisfactory for sulphur ore roasting furnaces, salt-cake furnaces, etc., but space does not permit of dealing with these further here.

Chemical Stoneware

Chemical stoneware is a similar product to the above, being prepared from clays or mixtures of clays having a wide range of vitrefication; but in some cases is made from fireclay intimately mixed with finely ground silica in the form of sand or flint, and fluxes such as felspar and whiting. It is customary to age the wet mix in the dark for long periods, in some cases as much as 12 months or more, during which time it may be passed through a mixing machine at intervals. The object of this process is to bring about thorough incorporation of the

materials with water and to encourage bacterial action† whereby the mix is brought to a high degree of plasticity. The shapes are made up by the usual methods, pipes being extruded and vessels being spun or cast. Firing is carried out in down-draught kilns with open fires, and glazed by throwing salt into the fireboxes at a certain stage of the firing, which, being volatilised, is carried into the kiln and forms a highly siliceous glaze on the surfaces of the goods. This glaze is only intended to give a finish, as the stoneware should be perfectly vitreous and impermeable throughout.

Good chemical stoneware resists all acids, with the exception of hydrofluoric, but lacks the fire-resisting qualities of certain brands of acid-proof bricks, partly owing to its fine texture as well as to differences in composition. It requires careful treatment in handling and is liable to crack if subjected to sudden changes of temperature.

It finds considerable application in nitric and hydrochloric acid plant for pipes, fume mains, storage vessels, towers, etc. During the war 40 to 80 gallon nitration pots for picric acid manufacture were made.

Acid-Resisting Cements

Turning to acid resisting cements, we find a large variety of materials used, but in general these consist mainly of silica sand or asbestos bonded with sodium silicate, tar, bitumen, sulphur or rubber.

Asbestos string, soaked in silicate solution, forms a good packing for joints and may be supplemented with a cement of asbestos powder and fine sharp sand. The sand should be ground to pass an 80 mesh sieve, and consist of sharp angular particles which interlock and give strength to the cement when set; fine asbestos powder serves to fill the voids between the sand particles, whilst the silicate binds the whole together.

It is better to use a highly siliceous silicate rather than the usual water-glass as sold for egg-preserving, and one containing about four molecules of silica to one of sodium oxide will be found satisfactory.

Acids liberate free silica from the silicate bond which sets hard and makes an impermeable joint; setting may be hastened by washing the joints with acid, but the strength is thereby impaired.

Space does not permit of the description of acid-resisting concretes and of methods of acid-proofing materials not normally resistant; nor can the use of rubber and ebonite for hydrochloric acid and vinegar plants, and of enamels and special materials, such as "Ceratherm," for lining pumps and impellers, be dealt with in the present article, the object of which is to give a brief sketch of the commoner non-metallic acid-resisting materials and their properties.

In conclusion the writer wishes to express his thanks to the management of the Castle Firebrick Co. for kindly allowing him to inspect their works and for explaining their methods.

Bituminous Paints

Two of the ways in which corrosion of iron and steel may be prevented are by preventing the access of moisture and by preventing electrolytic corrosion by using a covering which is also an insulator. It is claimed by the Durastic Bituminous Paint Co., Ltd., that their product, Durastic, subserves both of the above purposes. The metal is, by its use, covered with an air-excluding surface of bitumen compound, which has the same coefficient of elasticity as the iron which it covers. It is stated that Durastic contains no component which can harm the substance covered. As regards use in chemical works, it is stated that the material will stand a weak solution of sulphuric and hydrochloric acids, but for this it requires to be laid on in three coatings, each coating to set hard before the next one is put on, and each coating to be absolutely free from air bubbles. It is specially recommended by the makers for covering corrugated or other iron roofings where the deposit from chimneys and slack, if allowed to lie on the bare iron, would in a very short time cause peltng. The substance may be used on vats, tanks, and other plant, on cables, on works and buildings, and for general work. Durastic is a solution of high-grade bitumen freed from organic acids. It is resistant to heat, atmospheric influences, salt, spray, or sea water. The address of the manufacturers is 1, Central Buildings, Westminster, London.

† The nature of this is very imperfectly understood.

Acids: Their Handling, Storage and Transport

An Account of Modern Methods

One of the most recent additions to the Chemical Engineering Library—Second Series, published by Ernest Benn, Ltd., is "The Transport and Handling of Mineral Acids," by F. Hirsch, price 6s. Some extracts from the book are published below.

THE chemical engineer is frequently faced with the problem of installing pumping machinery for handling with efficiency and economy large volumes of acid. The choice of apparatus must naturally be governed by: (1) The chemical properties of the acid; (2) the volume and weight to be lifted against a given static head, and (3) the amount and type of power available. With a view to assisting in the choice of installations, a description is given of various devices of which the author has personal knowledge and which have been in successful operation in some of the largest works. There is little doubt (despite innumerable statements to the contrary) that where a large number of units are installed over a scattered area compressed-air circulating systems are to be preferred to pumps, i.e., pumps within the ordinary meaning of the term, which require a separate driving force for each unit. It is quite admitted that air-lift systems are extremely wasteful from the standpoint of power consumption. Against this they are comparatively free from wearing parts and consequent mechanical breakdown. The labour charges are low and their operating service is uninterrupted. These important factors entitle them to first consideration as a means of circulating and transporting large volumes of corrosive liquids.

Although many different designs of acid eggs are manufactured, the operating principle is the same in most cases. For handling sulphuric acid, the horizontal type is most favoured in this country. This is constructed of cast iron of not less than 2 inches in thickness, and is made in one piece, or in sections, according to size. It is usually spherically ended, with flanged manhole doors, bolted to the main body. Three flanged pipe holes are cast on the upper portion; the first is the acid inlet, the second is coupled to the compressed air supply and the third is the delivery, through which the acid is discharged.

It is now common practice to fit automatic filling and discharging devices to these cases in preference to hand-operated valves. A considerable saving in labour is thus effected, and the mechanism employed is usually of so simple a nature that little trouble is experienced due to failure in operation. Some manufacturers prefer to line the interior of the apparatus with lead when dealing with sulphuric acid of certain strengths. This precaution is hardly justified for ordinary purposes and has great attendant disadvantages. A slight crack in the lining allows of the passage of air under pressure, which may lodge behind the lead and force it away from the outer casing, thus rendering it useless as a protective lining and diminishing the capacity of the vessel. Cast iron has been proved to give satisfactory service, even with nitrous vitriol, and little contamination is attributable to action of the acid on these vessels. Acid-resisting stoneware blow-cases are used for handling nitric and hydrochloric acids. They should be of stout manufacture, and capable of withstanding a pressure of 60 to 80 lb. per square inch. All delicate mechanism should be avoided in constructing these vessels. Ebonite linings are also fitted to metal casings, for use with hydrochloric acid. They are only applicable where the temperature does not exceed 80° C., and cannot be used in positions where the acid is liable to come in contact with the outer casing.

Pumps

The low working efficiencies obtained in air-lift systems have led to the rapid development of pumping machinery. The modern acid pump is the outcome of a bewildering succession of improvements in design and construction, with the practical elimination of the more common faults. The marketed types are of very varied design and, generally speaking, a high standard of efficiency is maintained. A really good acid pump should combine simplicity of design with substantial construction. Freedom from surfaces subject to internal friction is an important feature, and there should be no possibility of contact between the acid and any part of the casing or mechanism with which it can react. Glands, valves and other sources of leakage should be reduced to a minimum to ensure satisfactory service. All pumping installations should be capable of operating at a slightly heavier load than it is

intended to impose. Extremes should be avoided; excess capacity is obviously wasteful and a low efficiency results; while pumps working on over-load have a seriously curtailed life, as a gradual tapering off of their activity takes place.

It would be a practical impossibility to specify a particular pump to meet all conditions; the choice must naturally be governed by local requirements and the particular acid to be handled. Where comparatively heavy lifts on the suction side are to be dealt with, consideration should be directed to the plunger type of pump. Under average working conditions it is quite capable of attaining 80 to 85 per cent. efficiency—even higher figures are sometimes obtained when working at low speeds. The principle embodied in this type of pump consists of a plunger operating with a reciprocating motion inside a cylinder. The up or suction stroke creates a partial vacuum, and a volume of liquid equal to the displacement of the plunger is caused to enter the pump chamber by the pressure of the atmosphere exerted on the surface of the supply. The down or compression stroke automatically closes the pump inlet and forces the liquid contained in the chamber to the delivery side, and ultimately to its destination.

Storage Vessels

Storage vessels that prove efficient and resistant to acids of certain strengths may break down and be entirely unsatisfactory when used for the same liquid under slightly varying conditions of density and temperature. It is therefore quite impossible to describe a standard type of receptacle that will prove suitable for the storage of a particular acid at all strengths and temperatures. The installation of vessels for the storage of any acid must necessarily be governed by the chemical activities of such acid under the particular prevailing conditions. The details given in the following pages embody the practices in vogue in many of the larger chemical works, with additional references to such special methods and devices as are considered of sufficient merit and interest for inclusion.

For sulphuric acid, stoneware and earthenware vessels are used only in exceptional cases and for small quantities. Receptacles for the storage of sulphuric acid may therefore be classified as (1) metal and (2) wooden shells lined with a suitable inert material. Boiler shell tanks constructed of mild steel plate are much favoured and are particularly suitable for the storage of 95 per cent. sulphuric acid; they may even be used for 70 per cent. and intermediate strengths provided that the interior of the tank and its contents are not unduly exposed to atmospheric moisture. Corrosive action is manifest with acid below these figures; lead-lined vessels should therefore be employed.

These boiler tanks are usually built on brick piers, and are placed in such a position and at such a height as to command the filling stations for both tank-wagons and carboys. Cast-iron vessels are sometimes employed for the storage of sulphuric acid, but owing to its more open crystalline structure it is not so resistant to attack as mild steel, and it cannot be recommended for general purposes.

A somewhat wider choice of materials for the construction of hydrochloric acid storage tanks is available than in the case of sulphuric acid. Brick, stoneware, wood, and vessels lined with india-rubber (both soft and vulcanised), asphalt, etc., all find application for the purpose.

Transport

The conveyance of corrosive acids from place of dispatch to destination is attended by many difficulties, and the manufacturer and carrier alike accept grave responsibilities in forwarding and delivering this class of goods. In the event of wreck during transport, not only is there the dead loss of the acid and the receptacle in which it was contained, but also the very serious damage to the railway company's rolling stock or carrier's wagon, as the case may be. The economics of the subject are largely dependent upon the facilities available for conveyance in bulk. Many manufacturers and consumers are without convenient railway sidings, and must therefore depend upon the more expensive method of delivery in small

packages. On the other hand, it not infrequently happens that where private sidings exist, no provision has been made for loading or discharging acid conveyed in tank wagons. There can be no doubt that the future development and improvement of transport facilities are largely dependent upon the closer co-operation of manufacturer and consumer.

In the small-package class are included carboys (both glass and porcelain), stone jars, Winchester quart bottles, and mild steel drums. The serious drawback to the use of the more fragile container is that the value of the receptacle is in most cases greater than that of the acid it contains. These vessels are called upon to encounter the hazards and mischance of travel, and expert supervision should be given to the packing and stowing of all materials, so as to prevent free movement en route. The bulk of acid traffic is by rail, and it is a matter for congratulation that the railway companies are continually inviting co-operation between the manufacturer, the consumer and railway company's experts, with a view to bettering the facilities for this class of traffic. Definite specifications are issued by the Railway Clearing House concerning these packages.

The transport in bulk of sulphuric acid does not present the difficulties associated with others of the mineral acids, nevertheless great care is necessary in the production of containers of sufficient strength to withstand the chance shocks encountered during travel. Specifications with somewhat elastic limits for the construction of vessels to carry sulphuric acid are issued by the Railway Clearing House. The main essentials as to design and strength of materials must be rigidly adhered to, and the wise policy dictates a margin of safety over and above the requirements of the railway companies. Tank wagons, carboys, drums, glass and earthenware bottles are all employed for the conveyance of sulphuric acid, the great bulk being, of course, carried in the first named. Tank cars of very large carrying capacity, and consequently of large dimensions, have been successfully employed for the purpose. In Germany, for instance, tanks with a capacity of 45 water tons are in use, the economic factor being in the deadweight against carrying capacity. A load of 12 to 14 tons has been found, all things considered, to be the most suitable for use on British railways, and it is on these capacities that the tank wagon trade appears to be developing. Tank wagons should be of substantial construction and of such design that there is a minimum risk of breakage and escape of contents in the event of wreck. The building of these wagons calls for considerable skill and knowledge, and the well-known firm of Charles Roberts and Co., of Wakefield, who were amongst the early pioneers in this class of work, have devoted a lifetime study to the subject. It is to this firm that many of the improvements embodied in the modern tank wagon are due.

Difficulties of Acid Transport

The transport of nitric acid presents many difficulties, and the limitation to small-sized packages has been a serious hindrance to the development of trade. Both manufacturers and consumers will welcome in consequence the revised regulations issued by the Railway Clearing House, dated July 1, 1925, in which they provide for the conveyance of nitric acid in tank wagons fitted with an aluminium barrel of some 99.5 per cent. purity.

Aluminium tank cars are extensively used in Germany. They have a capacity of 12.6 cubic metres and are arranged with an aluminium dish placed directly below the barrel to catch any possible leakage. The suitability of stainless steels for the production of tank wagons for use with this acid is being investigated by Charles Roberts and Co., who are particularly hopeful of carrying their experiments to a successful conclusion. It is somewhat premature to publish information relating to their investigations, and we can only anticipate that in the near future we shall see wagons in regular commission with stainless steel barrels for containing nitric acid.

The ordinary glass carboy is at present the principal container in use for the conveyance of nitric acid. Special precautions are necessary in packing these vessels; straw is debarred by the railway regulations, as are all other inflammable materials. Provided that the straw or other material is thoroughly impregnated with suitable fire-proofing liquids, there is little doubt that the railway companies will accept carboys packed in such materials for transport. Several of

these fire-proofing mediums are used in practice, chief among them being silicate of soda, calcium chloride and sodium sulphate. A modern practice, and one that is finding increasing favour, consists of imprisoning the carboy in a sheet-iron case provided with a tight-fitting lid. The points of contact with the carboy are fitted with asbestos cushions. The great advantage of this type of container is that in the event of breakage the acid contents are retained in the case, thereby reducing the risk of external damage. In America the practice is to box all carboys and surround them by a suitable inert material. The method is also followed in this country to some extent, the packing being carried out on the same lines as that laid down for conveyance by sea.

Nitric and sulphuric acid mixtures, containing not less than 20 per cent. of sulphuric acid, the specific gravity of the nitric acid to be not less than 1.42 and of the sulphuric acid not less than 1.84; or containing not less than 15 per cent. of sulphuric acid, the specific gravity of the nitric acid to be not less than 1.5 and of the sulphuric acid not less than 1.84, may be carried in tank wagons or steel drums by rail in the same manner as sulphuric acid alone. A written declaration must, however, be given with each consignment that the acids have not been used in the manufacture of nitro-glycerine or other explosives.

Hydrochloric Acid

The conveyance of hydrochloric acid has always been a troublesome matter, and to-day, in spite of numerous improvements in design and construction of large receptacles, we find the great bulk of this acid despatched and delivered in glass carboys. The handling of large supplies in small and fragile containers scarcely calls for comment; the additional labour required for handling, the excessive dead weight and the unavoidable loss due to accidental breakage are factors sufficient to condemn the use of the carboy for this class of traffic. We not infrequently find that the acid producer has spent large amounts of money in purchasing or constructing tank wagons for the conveyance of hydrochloric acid, only to discover that few customers have the necessary facilities for discharging these vessels or adequate storage space for bulk deliveries. Economic development of this trade largely depends on the amount and result of co-operation between manufacturer and consumer. If this is realised and carried into effect by both parties, we may anticipate the abolition of the carboy, except for small consignments, and a proportionate increase in tank wagon transport.

The specification issued by the Railway Clearing House relating to tank wagons for this acid is as follows: (1) An ordinary wagon is lined inside with felt, and pitched entirely throughout; (2) an enclosed wooden tank with manhole, constructed of best 3 in. red deals, is made to fit exactly inside the wagon; (3) the joints of the wooden tank are closely fitted and caulked with oakum; (4) the tank is lined inside to a thickness of 1 in. with a composition of pitch and sand, and inside this there is a further lining of $\frac{3}{4}$ in. tongued and grooved deal boards thoroughly impregnated with paraffin wax.

Acid-Resisting Semi-Plastic Compound

An acid-resisting semi-plastic compound, known as "Cabtyrit," for lining tanks, vessels, and containers of any kind for the storage and treatment of hot or cold hydrochloric, organic, and weak mineral acids is supplied by the St. Helens Cable and Rubber Co., Ltd., of Slough. They state that it can be applied to the surfaces of the vessels *in situ*, toughening or vulcanising at 90° C., and rapidly becoming an impervious protective covering. It may be obtained in sheets of various thicknesses. The surfaces of the iron vessels are first cleaned and sweated free from all moisture, and afterwards covered with Cabtyrit solution and allowed to dry. On this is laid the Cabtyrit sheet. When vulcanised by the action of any hot liquid other than rubber solvents it resists the action of hydrochloric acid (all strengths and up to 100°C.); sulphuric acid (in the cold, up to 80 per cent.; up to 100°C., up to 60 per cent.); sulphurous acid in solution; cold hydrofluoric acid; and organic acids such as lactic, formic, and tartaric, and acids arising from the decomposition of fruit and foodstuffs. Special designs of Cabtyrit-lined acid valves, capable of handling boiling hydrochloric acid, can be supplied. The material is used for lining apparatus such as rotating drums and cylinders for grinding ores to fine powders.

Some Acid-Resisting Products on the Market

Corrosion-Resisting Machinery

THE developments of the manufacture of corrosion-resisting machinery during recent years have been many and various. For example, Guthrie and Co., of Accrington, until recently only made use of a range of ceramic bodies and cements. In this was included Ceratherm—i.e., a tough stoneware which will withstand exposure to flame followed immediately thereafter by exposure to cold water, and which was found suitable for pump casings set in iron and for pump impellers for acids. Although these impellers did well at 3,000 revolutions, it was found possible to make even better impellers in Acidstone, a new composition which is acid-proof and remarkably strong and will withstand a great deal of hammering. The main use of this material appears to be agitators, plates, sieves, etc., and it will withstand boiling temperatures. Guthrie's also produce a whole series of porcelain lined vats, using their black acid-proof cement and afterwards embedding the porcelain in Acidstone. The porcelain-cum-Acidstone-cum-iron combination offers most remarkable strength, and makes an excellent guncotton stabilising vat or vat for dealing with any boiling dilute acids. Paper pulp digestors, especially of the rotary type, provide some fascinating problems. The erosion of the large masses of wood in the presence of free sulphurous acid and calcium bisulphite is most intense. Guthrie's have a lining for this which they claim is free from these faults.

Unexpected developments in pumping have arisen from the earthenware pump trade. Almost all Guthrie pumps are glandless and self-priming. They are made in Staybrite steel, silicon-iron, homogeneously lead lined materials, Acidstone, and in other combinations, the latest being a two-stage boiler feed pump with Staybrite impeller in a gun-metal case. It is interesting to note that the largest battery of Staybrite steel pumps in Europe was installed by Guthrie. In most circumstances the vertical type has been developed and tests have been made by running these pumps continuously for 168 hours a week for two or three years without a stop. Continuous use was the original aim of this class of pump. Now, however, applications have been found for this glandless vertical compensating and self-priming type for intermittent use, and by inserting a suitable valve resistance before and after the vertical centrifugal type a combination has been arrived at which has all the advantages of the centrifugal and all the advantages of the ram and the disadvantages of neither. This is very suitable for cases where strong acids, like sulphuric, have to be circulated through Glover and Gay Lussac towers, where very often in small works small quantities at high heads have to be provided for.

In the matter of agitation somewhat novel ideas have been adopted. For treating ores (such as tin ores) or in connection with the clays and magma used in the manufacture of pottery articles, very intimate mixing is required. Here the quick stirrer which has been developed and which is based on the idea of throwing at a high velocity a stream of magma through a rotating mass of the same material has led to extremely interesting and valuable results. The wheel or egg rotor which throws these streams is only a relatively very small thing, but it is surprising what a large amount of material may be intimately mixed by the use of agitators of this type rotating at a suitably high velocity when the agitators are only about a tenth the size of those they have supplanted. The materials of which these agitators have to be constructed vary in every case. In some of the most difficult cases it is necessary to manufacture the agitators in Acidstone, which stands very well indeed, being unaffected when manufactured in the form of discs running at high velocities. As a matter of fact a small spin box, such as is used in the artificial silk industry, manufactured from Acidstone, has been found to withstand 12,000 revolutions per minute quite satisfactorily. Curious abrasive problems arise. For instance, Acidstone when the velocity of rough material passing over it is low is actually a better resister to abrasives than hard steel or even porcelain, and can be used in conditions where rubber could not possibly be used. When the velocity gets very high, however, as for example, in the neighbourhood of 2,000 revolutions per minute with certain classes of tin ore, it has been found that while Acidstone is the only material which will withstand the tem-

perature and be strong enough to make the agitator, the best results have been obtained by covering Acidstone with rubber, not because the Acidstone will not withstand the corrosive action of the liquor, but because at certain velocities and in certain conditions rubber is the best anti-abrasive.

Prodorite

A great deal of attention has recently been devoted to Prodorite, which was the object of much discussion at the Chemical Plant Exhibition at the Chemical Congress. Prodorite contains from 7 per cent. to 12 per cent. of a specially prepared hard pitch, about 15 per cent. to 20 per cent. of specially selected mineral matter in a very fine state of subdivision, and the rest is made up of clean aggregate such as is used for ordinary concrete, consisting of properly graded broken stone and sand. The materials are mixed together at a temperature of about 260° C. The mineral matter, aggregate, and sand may all be siliceous in which case Prodorite is resistant to practically all acids except concentrated sulphuric acid and strongly oxidising acids like strong nitric acid and chromic acid; or limestone aggregate and sand may be used to resist alkaline liquors.

Prodorite is said to be somewhat stronger than the best cement concrete. It attains its full strength as soon as it is cold, which may be in a few minutes for small pieces and a few hours at most for larger pieces, whereas ordinary concrete require several weeks to set and only acquires its maximum strength after several years. Mechanical tests yield the following results: compression crushing strength of Prodorite, 6,447 to 5,196 lb. per sq. in.; tensile strength of Prodorite cement (pitch and filler only), 1,100 to 880 lb. per sq. in.; tensile strength of Prodorite mortar (pitch, sand and filler) 760 to 750 lb. per sq. in. Prodorite is resistant to the following chemicals: hydrochloric acid, any concentration, hot or cold; aqueous solutions of sulphurous acids; phosphoric acid at any temperature; sulphuric acid, 75 per cent. acid in the cold, and 65 per cent. acid in the hot; nitric acid, 40 per cent. in the cold and 25 per cent. at 80°; most organic acids; dilute and concentrated alkalis, though between 20 and 40 per cent. the resistance is less complete (ammonia and milk of lime are entirely without action); practically all salts and many other chemicals. Prodorite of special composition can be made to withstand hydrofluoric acid in all concentrations. Prodorite is a true concrete, is stated to be fully as strong as the best cement concrete, and can be reinforced if necessary. It is non-porous, gas and water-tight. It may be used for making floors in places where acids are used; in pipes for sewers, chemical works, etc.; for roofs, for chemical plants, including reaction vessels, receiver tanks, wagon tanks, acid eggs, absorption towers, and most purposes where chemical stoneware is now used; for tanks, large and small, and for lining tanks, more especially concrete tanks. The material is manufactured by Prodorite, Ltd., of Aldwych House, Aldwych, London.

Vitreosil

Amongst the many ceramic materials employed for the production of laboratory ware and the construction of chemical works and allied plants, "Vitreosil" (pure fused quartz or silica, SiO_2), undoubtedly possesses many exceptional advantages that appeal to the chemical manufacturer or engineer. It is resistant to mineral or organic acids, with the exception of hydrofluoric and at very high temperatures phosphoric. It is however possible to concentrate phosphoric acid in "Vitreosil" basins, and for all ordinary purposes they can be used with this acid. Sulphuric acid, nitric acid, hydrochloric acid or mixtures of these acids have absolutely no action on "Vitreosil" at any temperature, or in any concentration available in industrial use.

In the chemical or physical laboratory it is in many ways superior to porcelain or glass, being constant in weight and for many operations is available as a substitute for platinum and, as already stated, is heat and acid proof. The thermal endurance of "Vitreosil" is remarkable, it being unaffected by sudden and extreme temperature changes, owing largely to its low coefficient of expansion—about 1/17th that of glass. It is manufactured by the Thermal Syndicate, Ltd.,

Wallsend-on-Tyne, the pioneer firm, who have had 20 years practical experience in its production.

Acid-Resisting Felt Roofing

The destruction of felt roofings by acids, chemical fumes, etc., which are present in almost all industrial centres and especially in the neighbourhood of chemical works, is, of course, due to the fact that the perishable vegetable fibres have in themselves no resistance against acid attacks, but depend for their life on the bitumen impregnation and coating. Bitumen itself, although not acid proof, may be classed as an acid resister; indeed the adoption of bitumenised wood pulp conduits, ordinarily used for carrying underground electric cables, as a substitute for metal pipes in conveying acids, has shown that bitumen impregnation gives a considerable life to the wood fibres which would otherwise be destroyed by the acids. The saturation of the vegetable fibres of roofing felts dries out in course of time under sun-heat and the vegetable basis is left defenceless.

In the latest form of bitumenised roofing felt supplied by the Key Engineering Co., Ltd., 4, Queen Victoria Street, London, and Trafford Park, Manchester, the felt is formed of pure asbestos. This mineral felt is able to withstand acid attack to a remarkable degree. In the first place, the asbestos of which it is formed is well known as an acid resister, and indeed plain felts of long fibre asbestos are used for that reason as acid-filter cloths. The other component of these felt roofings is pure natural bitumen, which is employed for waterproofing only, as asbestos requires no life preserving aids. Asbestos fibres are extremely fine, non-absorbent and non-capillary. Asbestos felt is impregnated under pressure and the waterproofing impregnation is locked by the fine mineral fibres, so that it is not prone to volatilize under sun heat. In brief, vegetable fibres, being absorbent and capillary, assist evaporation and drying out; asbestos fibres resist it. Prolonged immersion in 25 per cent. and 50 per cent. solutions of sulphuric and hydrochloric acids has been shown to have practically no effect on asbestos felt roofing. After drying, the felt is perfectly pliable. A ten-day immersion in undiluted acid shows that the material cannot stand up against 100 per cent. sulphuric acid, as the bitumen runs, but 100 per cent. hydrochloric on the other hand appears to have little effect beyond slight blistering of the bitumenised surface. 100 per cent. ammonia has apparently no effect whatever on asbestos roofing felts.

Monel Metal

Monel metal consists of approximately 67 per cent. of nickel, 28 per cent. of copper and 5 per cent. of other metals. In appearance it is very similar to pure nickel, it takes the same high finish and has a slightly softer and somewhat more silvery lustre. It is strong, tough, ductile and far superior to copper, gunmetal and bronze under corroding influences. It machines readily, and can be rolled, drawn, cast, forged, soldered, brazed, and acetylene- or electrically-welded. In rolled form the metal has a tensile strength of 30 to 42 tons per sq. in., according to size and treatment, e.g., whether in rod, strip, wire or sheet form. The combination in the same alloy of a steel-like strength and a high resistance to corrosion has led to the use of Monel metal in many fields where it has had to withstand numerous corroding agencies under varying conditions of temperature, concentration and immersion. Monel metal is a natural alloy in that it is produced from its ore without separating the constituent metals. The ore is mined at Sudbury, Ontario, Canada, and refined by the International Nickel Co., of New York, the sole selling rights for Great Britain and European countries being held by G. and J. Weir, Ltd., of Cathcart, Glasgow.

The metal has a high tensile strength exceeding that of mild steel; toughness equal to that of wrought iron; retains a considerable proportion of its strength at high temperatures; is completely resistant to the action of brine and impure waters, atmospheric conditions, and alkalis; and is highly resistant to many acids. It is recommended for use with the following chemicals, among others:—acetic acid, aluminium sulphate, ammonia, benzoic acid, boric acid, calcium chloride, carbolic acid, chlorine, hydrocyanic acid, hydrofluoric acid, lime, phosphoric acid (cold, weak), potassium and sodium hydroxide, sulphur dioxide, etc. It is not recommended for chromic acid, nitric acid, sulphurous acid, and various others. In the chemical industry it is used in tanks, agitators, autoclaves, digestors, extractors, evaporators, stills,

filters, centrifugals, pumps and valves, filling machines, dryers, hoppers and chutes, conveying equipment, laboratory equipment, measuring equipment, fans and blowers. It is also used in many types of power plant. A large development has taken place in recent years in the use of Monel metal for the manufacture of centrifugal baskets for the drying of ammonium sulphate, where its application has been attended with excellent results.

Cold Application of Anti-Corroding Metals

A method has been worked out of applying cold, to practically any surface, a metal coat, this being put on with a brush. Here, however, its resemblance to a paint ends. The method depends on the use of the products known as "Metallon," supplied by Stewart, Browne and Co., of 70, Victoria Street, London. "Metallon" is chemically a cement, drying to the touch in a short time when applied, but taking a much longer time to acquire its full strength, which eventually becomes equal in hardness to the corresponding metal. "Metallon" when applied to any surface sets with a non-metallic matt appearance, but if scratched in any way the metallic nature of the coat is instantly made visible. It is made in the following range of metals:—zinc, aluminium, lead, brass, bronze, copper, nickel, and tin. Each, it is claimed, retains the chemical properties of the original metal from which it is prepared. Zinc, for example, supersedes galvanising, pickling being unnecessary and no alloy being formed on the surface. One particular property of "Metallon" is the phenomenal nature of its adherence; it will key firmly on surfaces such as bitumen, glass, porcelain, etc. Petrol, benzol, turpentine, etc., are stated to be without action on "Metallon." Thus barrels and tanks can be readily lined with it, the saving of initial cost being considerable, while effective protection can be given to internal and external structural work. It is important to note that "Metallon" is non-poisonous, and having no flash point is safe to handle and store. This preparation is British owned and made in England.

"Caposite" Acid-Resisting Asbestos

The Cape Asbestos Co., Ltd., have just put on the market a new type of asbestos which is noteworthy on account of its acid-resisting qualities. This asbestos is being sold under the name of "Caposite" Acid-Resisting Asbestos. It is obtained from the company's mines in the Transvaal. In some respects, it has the same characteristics as blue asbestos. What should interest users are its high acid-resistance, great tensile strength and heat insulating properties. The fibres of "Caposite" asbestos are long and very strong, and for this reason this material makes up into a durable cloth, which is admirable for the filtration of acids and corrosive liquors. For practical purposes "Caposite" cloth may be regarded as immune from the action of sulphuric, hydrochloric and nitric acids. After four hours immersion in 50 per cent. nitric acid at a temperature of 70° C., "Caposite" asbestos loses but 4.58 per cent. of its weight; with cold acid, the loss is only 2.12 per cent. The following is an analysis of "Caposite" asbestos:—Loss of water at incandescence, 3.79 per cent.; silica, 49.72 per cent.; magnesia, 3.77 per cent.; iron oxide, 37 per cent.; aluminium oxide, 5.72 per cent.; total, 100 per cent. The Cape Asbestos Co., import "Caposite" asbestos in crude form from their own mines in the Transvaal, and make it up into yarn, rope, cloth and packing for acid pumps. They also supply it in crude form to manufacturers of pipe and boiler coverings, and boiler mattresses.

Liquid and Plastic Roofing Cements

Resistant liquid and plastic roofing cements, for preserving and waterproofing roofs, etc., are supplied by Everseal Products, Ltd., of Newton Works, Goldsmith Street, London. Everseal Liquid consists in part of gilsonite asphalt and waterproofing oils, to give elastic and tough rubber-like qualities, while the asbestos fibre present acts as a binder. It is stated to withstand heat or cold, is impervious to water, and resists acid fumes and alkalis. It may be used on roofs, for covering pipes, conduits, foundations, concrete, wood, brick, stone, tiles, etc. It is very readily applied. Everseal Plastic is made of bitumen, long staple asbestos fibre, and gums. It gives a waterproof fire resistant surface which is acid, alkali, and gas proof. Both forms expand or contract with the material they cover, which prevents them from chipping, cracking, bulging, or peeling.

Mr. F. W. Salisbury-Jones's Affairs

First Meeting of Creditors

THE first meeting of creditors was held on August 13 at the London Bankruptcy Court under a receiving order made on a moneylender's petition against Mr. Frederick Wm. Salisbury-Jones, 27, Berkeley Square, W. Proofs of debt amounting to £216,300 were dealt with by Mr. Gaine, Official Receiver, included in the number being one for £205,544 tendered on behalf of the Westminster Bank, Ltd.

Mr. H. A. Maggs, representing the bank, stated, in reply to the Chairman, that it held securities for the debt, but was unable at present to assess their value. The proof accordingly was allowed to stand over.

Mr. Gaine reported that it appeared from the debtor's statement in preliminary meeting that for 28 years past he had devoted his time to the carbonising of coal, for which purpose a company, now known as Low Temperature Carbonisation, Ltd., was registered in 1905, with a nominal capital of £5,000, subsequently increased to a million and a quarter. Practically the whole of his present unsecured liabilities, which he estimated at between £7,000 and £8,000, had arisen in connection with the company, of which he acted as managing director until he resigned last August owing to ill-health. He was the holder of shares to the face value of £80,000 or £90,000 in the company, and did not admit insolvency.

The debt of the petitioning creditor was in respect of a promissory note for £1,800, for which the debtor received £1,300. He had asserted that he had repaid the whole amount of principal, together with a considerable amount for interest, but was still indebted for £2,000 in respect of interest and costs, for which judgment had been obtained. The debtor had further stated that but for the present coal strike there was not the slightest doubt that he could have pulled through matters. It was his intention to pay all debts in full and get these proceedings annulled.

Mr. G. G. Kemp (Ashurst Morris and Crisp), on behalf of the debtor, asked for the meeting to be adjourned for two months to enable his client to submit a scheme to the creditors.

Mr. Russell (Russell and Hinlip) said he represented Stock Exchange creditors, and supported the adjournment, being of opinion that they would get very little under an adjudication in bankruptcy, whereas the debtor's friends would doubtless assist him to bring in an acceptable scheme.

The meeting was adjourned till October.

The Smoke Abatement Conference, 1926

A SMOKE ABATEMENT CONFERENCE, under the auspices of the Smoke Abatement League of Great Britain, will be held from September 7 to 10, in a conference room specially erected in connection with the Universal Smoke Abatement Exhibition to be held September 6 to 18, at Bingley Hall, Birmingham. Among the interested groups is the Institution of Chemical Engineers. The conference will be concerned with remedies rather than effects and with broad principles rather than details. Among the subjects for discussion are: "Industry and Smoke Abatement"; papers on "Housing and Smoke Abatement," the first by Mr. E. D. Simon, Marion Fitzgerald, Dr. R. Unwin, chief architect, Ministry of Health, and Mr. P. Taylor, chief assistant architect, Ministry of Health, and the others by Dr. Leonard Hill, F.R.S., and Mrs. C. S. Peel, respectively; and papers on "Smokeless Production of Heat and Power," by Dr. Margaret Fishenden and Mr. A. S. E. Ackermann respectively. Visits will be paid to the Corporation Gas and Electricity Works and elsewhere, and various social functions will be held. All visitors may attend the conference, the fee for which is 10s. 6d. The address of the Smoke Abatement League is 33, Blackfriars Street, Manchester, and its new handbook on domestic smoke, entitled *Home Fires Without Smoke*, is in the press, and will be published by Ernest Benn, Ltd., in the autumn.

New German Alizarine Dye

A NEW alizarine dye for woollen goods designated Alizarine Astrol Violet B (patented) has been developed by the Bayer plant of the I.G. Farbenindustrie, reports Consul H. C. Claiborne, at Frankfurt, to the U.S.A. Commerce Department. The new dye is used chiefly for woollens and carpet yarns, and also for decorative and furniture materials. It is generally applied with an acid bath; after-treatment can also be applied with chromium salts without dulling the shades of the material.

Calcium Phosphate in Bread

AN authority at the Manchester Public Health Laboratory recently stated that the city had no reason to be alarmed at the recent agitation over the adulteration of bread. Complaints had been made at the Operative Bakers' Conference about "lumps of plaster of Paris" (or calcium sulphate) being found in bread, but though the Manchester analysts were continually examining loaves, flour, and baking powder, he could say definitely that they had never found any bread in Manchester that contained a material amount of calcium sulphate. It was impossible, he thought, to produce bread without any calcium sulphate, which was popularly known as "plaster of Paris." This substance was always found in calcium phosphate, which was one of the constituents of baking-powder, and it could not be avoided. If good calcium phosphate was used, however, the amount of "plaster of Paris" was very small indeed, and the analysts had found that Manchester bakers were always ready to improve the quality of their calcium phosphate if the analysts told them that it contained too much calcium sulphate. Bread containing a large quantity of calcium sulphate would certainly be harmful, and would set up intestinal irritation, but he was sure that no one need have any anxiety with regard to Manchester bread. Far more harmful was the introduction of per-sulphate or per-borate for bread whitening purposes. With one exception, which had been quickly remedied, Manchester bread had been free from this for several years.

Chemists and Future Wars

SIR JAMES IRVINE, of the University of St. Andrews, warned savants assembled at Williamstown, Mass., that war was possible as long as chemical factories existed, although all the other machinery of war was scrapped. He said that unless chemical warfare was abandoned, war in the future would probably be waged and won in a few days, and the victory would go to the nation possessing the most efficient peacetime chemical industry, which could be converted overnight for the production of poison gas. Despite the almost universal loathing and abhorrence with which the chemist regarded the idea of developing poisons for war, the general opinion of the scientists whom he had consulted was that in present conditions it was impossible to stop such development. As long as a chemical factory remained it could be used for gas poisons, and "thus we came to the uncomfortable conclusion that while there was a general consensus of opinion against this method of warfare, we were swept along by a tide against which it was impossible to struggle." Man had not yet risen above the envy and passion which made for war, he added, and chemists must continue to seek for methods of producing new and more effective poisons. At the same meeting, Professor J. F. Norris, President of the American Chemical Society, said that war in the future was inevitable, and urged the United States to prepare for gas warfare.

Good Prospects for the British Industries Fair

SO great has been the number of applications for space in the Birmingham section of the British Industries Fair next February that it has been decided to build extensions which will give a further letting area of approximately 30,000 sq. ft. In the London section, more than six months before the Fair opens, applications for space are already within 20,000 ft. of the total for the last Fair. The general section is larger than in the last Fair. The leather and leather goods section, the textile section and the clothing section are now very much larger. In order that every possible facility may be afforded to buyers attending the Fair from abroad the Government has decided that holders of the official invitation card may have their passports to England visaed, in cases where visas are necessary, without any charge being made.

Resumption of Production of Magadi Soda

THE directors of the Magadi Soda Co., Ltd., have announced that in consequence of orders received they have telegraphed instructions to their manager at Lake Magadi to expedite the resumption of production at the lake. In the directors' annual report of June last it was stated that production was temporarily stopped in consequence of the market position in the East and the necessity for considerable repair and new construction work.

From Week to Week

THE AMALGAMATED DYERS AND BLEACHERS' UNION figures for 1925 give the society's income as £148,935, and the expenditure as £133,660.

EIGHT AUSTRALIAN RESEARCH STUDENTS are to be sent abroad for training in research, and will undergo courses at the Fuel Research Station at Greenwich, the Low Temperature Research Station at Cambridge, etc.

A NEW AUSTRALIAN CEMENT WORKS, it is stated, is to be erected on an area of land near Port Fairy, in Victoria, by a company already in the industry. The general manager is at present negotiating with British capitalists.

The *Canadian Gazette* announces the re-appointment as members of the Canadian National Research Council for the three years ending March 31, 1929, of Sir G. Garneau, Dr. J. H. Grisdale, A. B. Macallum, J. B. McClelland, and Dr. R. F. Ruttan.

A WOOD PULP INDUSTRY, it is stated, may be established in Tasmania. It is understood that a Bill will be presented to the Tasmanian Parliament shortly, giving certain timber cutting and water rights to one of the promoters of the undertaking.

PROFESSOR F. H. RENNIE, M.A., D.Sc., presiding at the eighteenth meeting of the Australasian Association for the Advancement of Science, on Monday at Perth, chose as the title of his presidential address, "The Chemical Exploitation, Past, Present and Future, of Australian Plants."

ARTIFICIAL SILK FACTORIES will probably be erected in Australia, and the matter is at present receiving serious consideration from a powerful British enterprise. It is stated that tentative plans are being made for the erection of at least two factories. At present, artificial silk is not made in Australia at all.

THE SPALDING BEET SUGAR FACTORY, according to an official announcement, is to commence operations early next October. This factory, it will be remembered, was completed in the early part of the year, but was unable to deal with any of last season's beet owing to water difficulties. It is hoped that this difficulty has now been overcome.

THE AUSTRALIAN COUNCIL FOR SCIENTIFIC AND INDUSTRIAL RESEARCH is inviting nominations for travelling studentships in economic entomology, forest entomology, forest mycology, preservation of fruit, and general forest products work respectively. The value of each studentship is £300 per annum for two years, with a travelling allowance of £150.

THE JALLO RESIN FACTORY, states the Progress Report on Forest Administration in the Punjab for 1924-25, is now a co-partnership concern in which the Government is a partner. Continuous experiments in improving distillation processes and the modern plant employed have enabled the factory to produce a grade of resin which competes successfully with American products on the London market.

RECENT WILLS INCLUDE: Mr. Robert Dixon Steele, of Prenton, Cheshire, retired chemical manufacturer, £74,304.—Mr. Frederick Solomon Spiers, B.Sc., for some years secretary of the Faraday Society and editor of its publications, £1,655.—Dr. John Bell Simpson, of Wylam-on-Tyne, Durham, lately chairman of the Waste Heat and Gas Electrical Generating Stations, Ltd., and other companies, £812,170.

THE BRITISH PHOSPHATE COMMISSION'S affairs are not to be investigated further by the Australian Federal Government. When in London, Mr. Bruce, the Commonwealth Premier, intends to discuss the Commission's future conduct with the Imperial authorities. It is probable that in order to safeguard fully Australia's position arrangements will be made for constant storage of six months' supplies of phosphatic rock for the manufacture of superphosphates.

NIEULANT PELKMAN, LTD., announce that owing to the expansion of the business they have taken larger premises at 92, Tottenham Court Road, London, W.1, where both office and showrooms will now be situated. They are the sole agents in England for the Dutch company of Nieulant Pelkman, of Rotterdam and Brussels, manufacturers of bakery and chemical machinery, who for some years have carried on the English branch of their business under the title of "The Dutch Bakers' Machinery Co."

DR. R. F. RUTTAN, who since its establishment in 1917 has been chairman of the Canadian Associate Committee of Chemists, connected with the Advisory Council for Scientific Research, introduced at the last meeting the problem of the economic manufacture of potato starch in Canada. It was found, however, that only in years when there was an exceptionally large crop would it be possible to carry on the industry profitably. About 400,000 lbs. of potato starch are imported from Holland annually, and this is of a higher quality than could be produced in Canada on a small scale. Another subject considered was the development of the fish salting and curing industry.

DR. N. V. S. KNIBBS is expected to arrive in Australia this month, and will afterwards go on to China.

PRESIDENT JONES of the directorate of the Nitrate Producers' Association has tendered his resignation, which has been accepted.

MR. G. W. PARTRIDGE, a candle manufacturer, of Walsall, has been returned unopposed as the representative of Darlaston South on the Staffordshire County Council.

AN EMPLOYEE IN THE HILLMOUNT DYEING AND FINISHING WORKS, Cullybackey, named James Mewhirter (21), fell from a ladder at the works on Wednesday, August 18, and was seriously injured.

THE JOURNAL OF THE SCIENCE ASSOCIATION of Maharajah's College, Vizianagaran, S. India (Volume II, No. 41, 1926), contains a paper on "The Phenomenon of Valency" by Rejendralal De.

STUDENTS OF CHEMISTRY in German universities have, according to comparative statistics recently published, increased from 1 per cent. on a total of 69,644 in 1914 to 5 per cent. on a total of 81,699 in 1925.

DR. FRANCIS LIONS has been appointed lecturer and demonstrator in chemistry at Sydney University, Australia. He is at present engaged in chemical research at the Dyson Perrins Laboratory, Oxford University.

A FIREDAMP DETECTOR for application to miners' electric hand lamps is described in a paper entitled "The Detection of Firedamp by Electrical Means," by C. S. W. Grice and A. G. Gulliford, published in volume 5 of *Fuel in Science and Practice*.

ORDERS FROM PULP AND PAPER MILLS are likely to benefit the British engineering industry, states Mr. G. C. Holt, the representative of large British engineering interests, on his return from a business tour in Canada and the United States of America.

THE LORD PRESIDENT OF THE COUNCIL has approved the appointment of Mr. W. A. C. Goodchild, an assistant secretary in the Scottish Office, to be a member of the Committee recently appointed to inquire into the scope and administration of the Poisons and Pharmacy Acts.

THE CHAIRMAN OF THE CHEMICAL AND METALLURGICAL CORPORATION announces that much of the new plant on the new works site near Wigg's Works at Runcorn is already in existence, and most of the remainder is on order. The first part of the Runcorn plant should be ready in about six months.

MR. ARTHUR WESTLAKE, the managing director of the Staveley Iron and Coal Co. and its subsidiaries has resigned his position. He has been associated with the Staveley Co. for 38 years, part of the time as assistant to the coal sales manager in London, later as coal sales manager, and afterwards as commercial manager of the company at Staveley.

APPLICATIONS ARE INVITED for the following appointments:—Senior Metallurgist to the British Cast Iron Research Association. Not less than £800. The Director, 75, New Street, Birmingham, September 15.—Adviser in Agricultural Chemistry in the University of Durham (Armstrong College), Newcastle-upon-Tyne. £300 plus bonus. The Registrar, October 1.—Full-time teacher in the Chemistry Department of the Northern Polytechnic. Burnham Scale. The Clerk to the Governors, Northern Polytechnic, Holloway, London, N.7. September 6.—Research Bio-Chemist in the Walter and Eliza Hall Institute of Research, Melbourne, Australia. Two years. £750. The Agent-General for Victoria, Victoria House, Melbourne Place, Strand, London, W.C.2. September 30.

Obituary

DR. DIERKSEN, of the Badische Anilin- und Sodafabrik, recently, as the result of an accident.

MR. ARTHUR BAKEWELL BAYLIS, of Rotherham, aged 75, chairman and managing director of the Midland Iron Company and director of the British Iron Manufacturers' Research Association and Hoop Manufacturers' Association.

PROFESSOR LEO VON LIEBERMANN DE SZENTLORINC, Director of the Institute of Hygiene of the University of Budapest, on July 21, aged 74. He was concerned in combating the adulteration of foods, and in the establishment of a State Institute of Chemistry in Budapest.

MR. ALLIN COTTRELL, M.Sc., F.I.C., M.I.CHEM.E., at Ashton Infirmary, lecturer on Technical Chemistry in Edinburgh University. He took the degree of B.Sc. with honours at Manchester University in 1907, and was later appointed lecturer in Technical Chemistry in Dewsbury Technical College. During the war he was engaged in the study of the manufacture of high explosives, and was appointed acids manager at H.M. Factory at Gretna. At the close of the war he was appointed to the Lectureship in Technical Chemistry in Edinburgh University. An authority on the manufacture of acids, he published in 1923 a comprehensive work on the manufacture of nitric acid.

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Abstracts of Complete Specifications

255,516. CONDENSATION PRODUCTS OF PHENOL AND THE LIKE. A. H. Brown, 17, Orchard Road, Hayes, Middlesex, and The Siluminite Insulator Co., Ltd., 16, Dowgate Hill, London, E.C.4, and The Green, Southall, Middlesex. Application date, April 17, 1925.

An aldehyde, ketone, or the like and a phenolic substance, both at ordinary temperatures, are condensed in the presence of a hot liquid such as castor oil, linseed oil, boiled oil, or other liquid not miscible with water, and which will not react with any of the ingredients or the products. No further heating is employed, and the amount of liquid should not exceed 3.2 per cent. by volume of the other constituents. When the condensation is complete, the water separates at a lower layer and the upper layer contains the reaction product with some oil. The product can be thickened to any desired extent by heating, and the final product will remain in that condition indefinitely. An accelerator such as ammonia may be used.

255,522. ARSENIC PENTOXIDE, MANUFACTURE OF. P. Askenasy, 44, Kaiserallee, Karlsruhe, Germany, and E. Elöd, 244, Kriegstrasse, Karlsruhe, Germany. Application date, April 21, 1925.

A mixture of arsenic trioxide and 60 per cent. nitric acid is treated in a closed vessel with oxygen at a pressure of 20 atmospheres and temperature of 70°–90° C. The arsenic trioxide is converted into the pentoxide almost completely in 12–18 hours, and the nitric acid remains unchanged and can be recovered by distillation. The time of the reaction depends on the intensity of stirring the mixture, and may be reduced to half an hour. The arsenic pentoxide may be neutralised with calcium hydroxide to obtain calcium arsenate for use as a fungicide, etc. Arsenic sulphide may be treated in the same manner as the trioxide. The small quantity of nitric acid employed renders this process very economical.

255,569. BURNING MATERIAL IN ROTARY KILNS, PROCESS FOR. M. Vogel-Jorgensen, 103, Nyelandsvej, Fredriksberg, near Copenhagen, Denmark. Application date, May 4, 1925.

Material which is burned in an inclined rotary kiln in the form of slurry, e.g., in the manufacture of cement by the wet process, is liable to form into small solid lumps from which carbon dioxide is not readily driven off. In this invention, the lumps are broken up by one or more grinding rollers in the interior of the kiln before they are delivered to the zone where the carbon dioxide is driven off.

255,630. INTERMEDIATES OF THE ANTHRAQUINONE SERIES, MANUFACTURE OF. British Dyestuffs Corporation, Ltd., 70, Spring Gardens, Manchester. W. H. Perkin, South Parks Road, Oxford, and H. M. Bunbury, Crumpsall Vale Chemical Works, Blackley, Manchester. Application date, July 8, 1925.

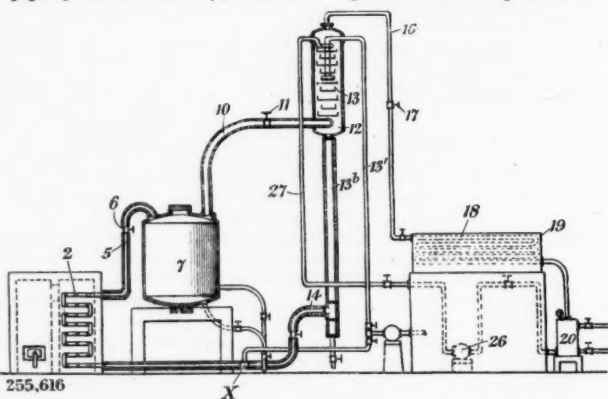
A simplified method has been found for obtaining the monobenzoyl and substituted monobenzoyl-diamino-anthraquinones by treating the diamino-anthraquinones with benzoic anhydride or a substituted benzoic anhydride, preferably in the presence of a solvent such as nitrobenzene. In an example, 1:5-diamino-anthraquinone and nitrobenzene are treated with benzoic anhydride in nitrobenzene solution at 175° C. The mixture is cooled to 120° C. and filtered, the residue being the dibenzoyl compound. The filtrate is allowed to stand until its temperature reaches 25°–30° C., when the monobenzoyl derivative crystallises out. A mixture of 100 parts of 1:5-diamino-anthraquinone and 110 parts of benzoic anhydride yields 98 parts of mono-benzoyl-amino-anthraquinone and 31 parts of the dibenzoyl-derivative.

255,616. CONVERTING HEAVY HYDROCARBONS INTO LIGHT HYDROCARBONS, PROCESS FOR. F. B. Dehn, London. From Universal Oil Products Co., Straus Building, 310, South Michigan Boulevard, Chicago. Application date, June 29, 1925.

In this process, a maximum yield of low boiling point oils is obtained from heavy hydrocarbons without the production

of any substantial liquid residue, but only of coke residue. This is effected by treating the oil under cracking conditions with a definite quantity of reflux condensate, after which the mixture will separate into oil and solid residue without the application of excessive heat.

The oil mixed with reflux condensate is passed through a heating tube 2 at a pressure of 120 lbs. per square inch and temperature of 800°–900° F. The oil then passes through pipe 5 to chamber 7, where it separates into vapour and



coke-like residue. The vapour represents substantially the whole volatile content of the oil and passes through pipe 10 to dephlegmator 12 which is maintained at about 525° F. to produce sufficient reflux condensate to add to the raw oil. The condensate passes through pipes 13b and 14, and is mixed with the raw oil at the point X. The uncondensed vapour passes through the pipe 16 to a condenser 18, and the distillate is collected in a receiver 20. A pump 26 may be provided to return some of the distillate through pipe 27 to the dephlegmator.

255,655. RECOVERY OF VOLATILE SUBSTANCES. J. V. Johnson, London. From Badische Anilin und Soda Fabrik, Ludwigshafen-on-Rhine, Germany. Application date, August 12, 1925.

When vapours or gases are adsorbed by solid adsorbents, any moisture in the gases is also adsorbed, so that the proportion of vapour or gas which it is desired to recover is reduced, and a more frequent regeneration of the adsorbent is necessary. This process employs a combination of adsorbents which are capable of adsorbing water in preference to the desired organic compounds in such a manner that by displacement of the first adsorbed organic vapour by adsorbed water, the organic compounds are separated from the water and may be adsorbed in a pure state in a later stage. The adsorbent which is charged with water may be regenerated by hot flue gases, and the adsorbent charged with the organic vapour is regenerated by steam, with or without a vacuum. Hydrophilic adsorbents such as silica gel, alumina gel, natural or artificial zeolite, may be employed either alone or combined with hydrophobic components such as active charcoal. If a hydrophilic agent such as silica gel is employed alone, it is arranged in a number of vessels in series so that when the whole system is saturated, the first vessel contains water and the later vessels contain the organic vapour. A combination of two hydrophilic substances may be used, the first having large pores to adsorb the water, and the second having smaller pores to adsorb vapours such as benzene or ethylene. The hydrophilic agent may be combined with active charcoal, which has a small adsorbing power for water, and which retains substantially only the organic vapour. Some examples of the adsorption of benzene vapour are given.

255,692. PHENOLIC CONDENSATION PRODUCTS, MANUFACTURE OF. H. Wade, London. From S. Karpen and Bros., 636, West 22nd Street, Chicago, Ill., U.S.A.

These condensation products are obtained by digesting a

phenolic body in a residual liquor obtained from the reaction between methylene chloride and aqueous ammonia, *i.e.*, a solution of hexamethylenetetramine and ammonium chloride. A mixture of methylene chloride with a large excess of aqueous ammonia is heated to 100° C. till the reaction is complete. The excess of ammonia is then distilled off, and the liquor digested with the phenolic body in about 50 per cent. excess at 100° C. A fusible and soluble resin is obtained and may then be distilled to remove water and part of the free phenol. The resulting resin may be treated with formaldehyde or hexamethylenetetramine to form an infusible and insoluble product.

255,731. BENZANTHRONE DERIVATIVES CONTAINING SULPHUR, MANUFACTURE OF. J. Y. Johnson, London. From I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, January 13, 1926.

These benzanthrone derivatives are obtained by treating Bz 1-halogen-benzanthrones which may also contain further substituents, with hydrosulphites or with aldehyde sulphonylates, preferably in a neutral or alkaline solution with a solvent such as aqueous alcohol. The products are sulphinic acids of the benzanthrone series, the salts of which may be transformed into the salts of the corresponding sulphonic acids by oxidation in aqueous solution. By a reducing treatment with an aqueous solution of sodium polysulphides, the corresponding benzanthrone-mercaptans are obtained. Sodium sulphide at 70°-80° C. yields Bz 1, Bz 1'-benzanthrone-sulphides, and at higher temperatures isodibenzanthrones in addition to the mercaptans. The sulphinic acids or their alkyl or acyl derivatives may be fused with alkali metal alcoholates to obtain isodibenzanthrone. The sulphinic acids may be heated with inert high boiling diluents such as paraffin oil to obtain Bz 1, Bz 1'-benzanthrone-sulphides, or with sulphuric acid of 60° Bé. to obtain the disulphides. Several examples are given.

255,766. AMMONIUM PHOSPHATES, MANUFACTURE OF. J. Y. Johnson, London. From I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Application date, March 3, 1926.

Phosphoric anhydride obtained by combustion of phosphorus is absorbed by means of ammonium phosphate solutions, *e.g.*, mono-ammonium phosphate. Ammonia may be added during absorption to maintain a proportion of 1 molecule of phosphoric acid to 1 molecule of ammonia. The reaction is effected in absorption towers to obtain a strong solution of ammonium phosphate, which crystallises on cooling. The mother liquor is then used again for absorption. Any of the three ammonium phosphates may be produced in this manner.

NOTE.—Abstracts of the following specifications, which are now accepted, appeared in THE CHEMICAL AGE when they became open to inspection under the International Convention:—233,734 and 236,170 (Verein für Chemische und Metallurgische Produkten) relating to high-percentage anthracene and carbazole from crude anthracene, see Vol. XIII, pp. 71 and 232; 234,852 (M. Buchner) relating to hydrofluoric acid, see Vol. XIII, p. 133; 238,225 (Soc. of Chemical Industry in Basle) relating to manufacture of new vat dyestuffs, see Vol. XIII, p. 402; 240,170 (Aktieselskapet Kristal) relating to precipitation of substances in coarse granular form from solutions, see Vol. XIII, p. 581; 243,766 (Farbenfabriken vorm. F. Bayer and Co.) relating to manufacture of benzimidazoles, see Vol. XIV, p. 138; 244,782 (Akt.-Ges. für Anilin Fabrikation) relating to azo dyestuffs, see Vol. XIV, p. 211.

International Specifications not yet Accepted

253,122. AMMONIA SYNTHESIS. G. F. Uhde, Bövinghausen, Westphalia, Germany. International Convention date, June 4, 1925.

Catalysts for ammonia synthesis comprise compounds of iron and cyanogen in which the cation is a metal other than iron. Thus a mixture of potassium ferrocyanide and aluminium chloride is heated and the product dried.

253,149 and 253,150. SODIUM AND BARIUM COMPLEX FLUORIDES. A. Meyerhofer, 10, Göthestrass, Zurich, Switzerland. International Convention date, January 10, 1925.

253,149. Specification 245,719 (see THE CHEMICAL AGE, Vol. XIV, p. 254) describes the use of silicofluorides and boro-

fluorides to effect a series of reactions in a cyclic process in which sodium carbonate and ammonia are obtained. In the present invention other complex salts such as titanofluorides are used for these reactions.

253,150. Barium phosphate is treated with hydrofluosilicic acid, and the barium silicofluoride heated to obtain barium and silicon fluorides. The barium fluoride is treated with calcium nitrate or hydroxide to obtain barium nitrate or hydroxide and calcium fluoride, which latter with the silicon fluoride is used to produce hydrofluosilicic acid and then barium silicofluoride for use again. The barium nitrate or hydroxide may be used for the production of hydrogen peroxide.

253,488. DYES AND DYEING. I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. (Assignees of Akt.-Ges. für Anilin Fabrikation, Treptow, Berlin.) International Convention date, June 9, 1925.

An oxyazine is produced by alkaline fusion of derivatives of 1:2-naphthophenazine or 1:2:1':2'- or 1:2:2':1'-dinaphthazine which have a sulpho group in the 8-position and also contain other hydroxyl- or sulpho-groups, and coupled with a diazo compound. The oxyazine components have a good affinity for cotton and may be developed on the fibre with diazo compounds. In an example, the product obtained by alkaline fusion of 4:8-disulpho (or 4-oxy-8-sulpho)-1:2-naphthophenazine, which may be obtained from 4:8-disulpho (or 4-oxy-8-sulpho)-1:2-naphthoquinone and 1:2-diaminobenzene, is coupled with diazotised sulphanilic acid or naphthionic acid, yielding a dye which gives yellow shades on wool. A large number of other examples of cotton and wool dyestuffs are given.

253,507. HYDROGENISING COAL, HEAVY OILS, ETC. A. J. Kling, 6, Villa George Sand, Paris, and J. M. F. D. Florentin, 2, Quai du Marche Neuf, Paris. International Convention date, June 12, 1925.

Heavy or cyclic compounds such as naphthalene, anthracene, cyclohexane, and their derivatives, heavy tar oils, pitch, coal, colophony, asphalt, or petroleum distillation residues, are heated with hydrogen under pressure in presence of a catalyst furnishing addition or substitution derivatives splitting at lower temperatures, *e.g.*, 350°-460° C. without the formation of coke or tar. Suitable catalysts are chlorides, bromides, iodides, and fluorides of the alkaline earth and earth metals. Thus, naphthalene may be heated with hydrogen in the presence of 5 per cent. of a mixture of ferric and aluminium chlorides, at a pressure of 90 kg. per sq. cm. A light oil distilling at 100°-200° C. is obtained.

253,520. ALKALI METAL OXIDES. Roessler and Hasslacher Chemical Co., 709, 6th Avenue, New York. Assignees of Deutsche Gold und Silber Scheideanstalt vorm. Roessler, Frankfurt-on-Main, Germany. International Convention date, June 8th, 1925.

Alkali metal oxides are obtained by treating alkali metals with air in the presence of a solid diluent, which may be some of the alkali metal oxide previously prepared. The process may be carried out in a rotary kiln in a continuous manner.

253,540. AMMONIA SYNTHESIS. Soc. d'Etudes Minières et Industrielles, 1 bis, Rue de Havre, Paris. International Convention date, Jan. 8, 1925.

A nitrogen-hydrogen mixture is passed at a pressure which may be as low as atmospheric, and at a temperature of 500° C. over a mixture of iron, nickel, cobalt, tungsten or molybdenum, with lithium nitride or amide, and alumina, magnesia or lime.

253,542. BORNYL ESTERS. L. and E. Darrasse, 13, Rue Pavée, Paris, and L. Dupont, 2, Villa David, Vincennes, Seine, France. International Convention date, June 12, 1925. Addition to 164,357. (See THE CHEMICAL AGE, Vol. V., p. 166.)

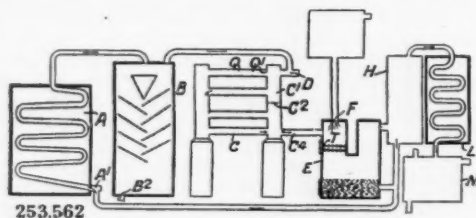
Bornyl esters are produced by heating together dry oxalic acid, turpentine, and a mixture of toluene and benzene, the quantity of solvent being double the quantity of turpentine.

253,550. TITANIUM OXIDE. J. Blumenfeld, Launay, Eure, France. Assignee of Fabriques de Produits Chimiques de Thann et de Mulhouse, Thann, Haut-Rhin, France. International Convention date, June 11, 1925.

Ilmenite is treated with sulphuric acid, and the solution cooled to 5° to -5° C. to crystallise ferrous sulphate. The solution is hydrolysed without dilution, and no separation of ferrous sulphate occurs on cooling to room temperature.

- 253,562. CRACKING HYDROCARBONS. Chemical Research Syndicate, Ltd., 7642, Woodward Avenue, Detroit, Mich., U.S.A. International Convention date, June 15, 1925.

Oil vapour is heated to 1,000° F. in the presence of iron oxide, and then cooled to 600° F. to deposit carbon. Oil is



passed from A¹ through a pipe still A to a vapour separator B. The vapour is mixed with steam admitted at D, and passes through the upper and then through the lower tubes of a converter C. The vapour is then treated with a spray of oil or water from a nozzle F in a chamber E to cause separation of carbon, and passes through a dephlegmator H to a condenser L and separating tank M. If oil is used in E, the liquid is drawn off, mixed with reflux from the dephlegmator, and passed to the inlet A¹. The converter tubes Q may contain star-shaped cores of iron oxide.

- 253,872. MAGNESIUM CHROMATE AND DICHROMATE. I. G. Farbenindustrie Akt.-Ges., Frankfurt-on-Main, Germany. Assignees of Farbwerke vorm. Meister, Lucius, and Brüning, Höchst-on-Main, Germany. International Convention date, June 22, 1925.

Calcium chromate is boiled with magnesium sulphate in a reflux apparatus or under pressure, or, in general, an alkali or alkaline earth chromate is treated with a magnesium salt of an acid whose alkali or alkaline earth salt is less soluble than the magnesium chromate. Several other examples are given.

- 253,875. ZINC OXIDE. New Jersey Zinc Co., 160, Front Street, Manhattan, New York. Assignees of F. G. Breyer, E. H. Bunce, and J. H. Weikel, Palmerton, Pa., U.S.A. International Convention date, June 18, 1925.

Zinc oxide which contains some acid radical is treated with steam at 100°-150° C. to render it suitable for use in rubber mixtures. The oxide is fed from a hopper to a vertical retort set in a flue containing horizontal baffles to circulate the heating gases. The oxide passes to a chamber below, to which steam is admitted, the contact extending over several hours. The oxide may then pass through the apparatus again, or may be dried in a similar apparatus to which steam is not admitted.

- 253,877. MALEIC AND SUCCINIC ACIDS. Zaidan Hojin Rikagaku Kenkyujo, 31, Kamifujimae-cho, Komagome, Hongo-ku, Tokyo. Assignees of T. Yabuta, 88, Yoda, Setagayamachi, Ebara-gori, Tokyo. International Convention date, June 22, 1925.

An electrolytic cell contains a solution or suspension of furfural in 5 per cent. sulphuric acid as the anolyte, and 10 per cent. sulphuric acid as the catholyte. The electrodes are lead pipes through which cooling water is passed, and a current density of 0.02 amps. per sq. cm. and temperature of 35° C. are employed. When the anolyte no longer gives the reaction of furfural with aniline acetate, it is concentrated, and the product, consisting of 80 per cent. succinic acid and 20 per cent. maleic acid, is fractionally crystallised. If a lead peroxide anode is employed with a current density of 0.06 amps. per sq. cm., the product is mainly maleic acid. The anolyte may contain cerium, vanadium and manganese compounds as catalysts.

- 253,897. PURIFYING OILS. Soc. Anon. Industrielle des Matières Grasses et Savons, 7, Phidion Street, Athens. International Convention date, June 22, 1925.

Palm oil dissolved in benzene is agitated with sodium hydrate or carbonate dissolved in alcohol and allowed to stand. The layers are separated and the solvents distilled off. The soap solution may be first treated with acid to obtain the fatty acids.

LATEST NOTIFICATIONS.

- 256,964. Manufacture of valuable liquid products from tars, mineral coals, mineral oils, resins, asphalts, and the like. I. G. Farbenindustrie Akt.-Ges. August 14, 1925.
256,965. Manufacture of valuable liquid products from coal, tars, mineral oils, and the like. I. G. Farbenindustrie Akt.-Ges. August 14, 1925.
256,972. Manufacture and production of mixed fertilizer. I. G. Farbenindustrie Akt.-Ges. August 14, 1925.
256,989. Manufacture of vat-dyestuffs. I. G. Farbenindustrie Akt.-Ges. July 21, 1925.

Specifications Accepted with Date of Application

- 242,223. Conversion of high boiling into low boiling hydrocarbons, Process for. H. Wolf. November 3, 1924.
245,128. Azodyestuffs, Manufacture of. W. Carpmæl. (I. G. Farbenindustrie Akt.-Ges.) December 21, 1925.
251,641. Electrolytic manufacture of aluminium, Method for. H. Dolter, May 4, 1925.
251,666. Ester of N-allyl-2:6-dimethyl-4-oxypiperidine, Manufacture of. H. Staudinger. May 4, 1925. Addition to 232,207.
253,879. Alloys, Manufacture of. International Nickel Co. June 16, 1925.
256,281. Dyestuffs and Intermediates. R. F. Thomson, J. Thomas, and Scottish Dyes, Ltd. February 2, 1925.
256,294. Extraction of salts from aqueous solutions, Apparatus for. A. J. Stephens. (Salt Productions Syndicate, Ltd.) April 1, 1925.
256,302. Pigments and paints, Preparation of. C. Weizmann and J. Blumenfeld. April 22, 1925.
256,351. Effecting intimate contact between liquids and gases, Apparatus for. Kirkham, Hulett and Chandler, Ltd., and W. F. Slater. May 25, 1925.
256,385. Drying and neutralising sulphate of ammonia, Apparatus for. T. B. Smith. July 13, 1925.
256,394. Artificial resins, Manufacture of. A. Regal. July 29, 1925.
256,428. Removal of iron from materials containing it. J. Y. Johnson. (Badische Anilin und Soda Fabrik.) October 3, 1925.
256,433. Chromium, Manufacture of. J. H. Beaumont. (Metal Research Corporation.) October 14, 1925.
256,457. Copper alloys, Manufacture of. M. G. Corson. December 21, 1925.

Applications for Patents

- Badische Anilin und Soda Fabrik and Johnson, J. Y. Means for introduction of materials into high-pressure vessels. 20,173. August 16.
British Dyestuffs Corporation, Ltd., Horsfall, R. S., and Lawrie, L. G. Manufacture of anti-dimming agents. 20,389. August 18.
British Dyestuffs Corporation, Ltd., Shepherdson, A., and Tatum, W. W. Anthraquinone dyes, etc. 20,507. August 19.
British Dyestuffs Corporation, Ltd., Chapman, E., and Hollins, C. Photographic processes. 20,508. August 19.
British Dyestuffs Corporation, Ltd., Chapman, E., and Hollins, C. Manufacture of ink. 20,509. August 19.
British Dyestuffs Corporation, Ltd., Chapman, E., and Hollins, C. Manufacture of aerated waters, etc. 20,510. August 19.
British Dyestuffs Corporation, Ltd., and Hailwood, A. J. Vat dyestuffs, etc. 20,511. August 19.
British Dyestuffs Corporation, Ltd., Everatt, R. W., and Rodd, E. H. Separation of tertiary from secondary and primary amines. 20,688. August 21.
Carpmæl, W., and I. G. Farbenindustrie Akt.-Ges. Manufacture of artificial silk, etc. 20,205. August 16.
Carpmæl, W., and I. G. Farbenindustrie Akt.-Ges. Manufacture of dyestuffs of the anthracene series. 20,316. August 17.
Carpmæl, W., and I. G. Farbenindustrie Akt.-Ges. Manufacture of fungicides. 20,675. August 21.
Chemische Fabrik auf Actien, vorm. E. Schering. Manufacture of esters of isoborneol, etc. 20,487. August 19. (Germany, April 11, 1925.)
Geere, E. W. Preparation of chemical substances. 20,638. August 21.
I. G. Farbenindustrie Akt.-Ges. Manufacture of organic compounds. 20,381. August 18.
I. G. Farbenindustrie Akt.-Ges. Manufacture of photographic silver halide emulsions. 20,169. August 16. (Germany, October 14, 1925.)
I. G. Farbenindustrie Akt.-Ges. Purification of hydrogenation products of carbonaceous materials. 20,379. August 18. (Germany, August 20, 1925.)
I. G. Farbenindustrie Akt.-Ges. Manufacture of liquid products from carbonaceous materials. 20,380. August 18. (Germany, September 2, 1925.)
Richards, A. A. Apparatus for dyeing and weaving. 20,349. August 18.
Richards, A. A. Dyeing-table. 20,350. August 18.
Richards, A. A. Apparatus for dyeing and weaving. 20,691. August 18.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

ACID ACETIC, 40% TECH.—£19 per ton.
ACID BORIC, COMMERCIAL.—Crystal, £57 per ton, Powder, £39 per ton.
ACID HYDROCHLORIC.—3s. 9d. to 6s. per carboy d/d, according to purity, strength, and locality.
ACID NITRIC, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.
ACID SULPHURIC.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations; 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.
AMMONIA ALKALI.—£6 15s. per ton f.o.r. Special terms for contracts.
BISULPHITE OF LIME.—£7 10s. per ton, packages extra, returnable.
BLEACHING POWDER.—Spot, £9 10s. d/d; Contract, £8 10s. d/d, 4-ton lots.
BORAX, COMMERCIAL.—Crystal, £23 per ton. Powder, £24 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)
CALCIUM CHLORATE (SOLID).—£5 12s. 6d. to £5 17s. 6d. per ton d/d cart. paid.
COFFER SULPHATE.—£25 to £25 10s. per ton.
METHYLATED SPIRIT 64 O.P.—Industrial, 2s. 5d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.
NICKEL SULPHATE.—£38 per ton d/d.
NICKEL AMMONIA SULPHATE.—£38 per ton d/d.
POTASH CAUSTIC.—£30 to £33 per ton.
POTASSIUM BICHROMATE.—4½d. per lb.
POTASSIUM CHLORATE.—3½d. per lb., ex wharf, London, in cwt. kegs.
SALAMMONIAC.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton, cart. paid.
SALT CAKE.—£3 15s. to £4 per ton d/d. In bulk.
SODA CAUSTIC, SOLID.—Spot lots delivered, £15 2s. 6d. to £18 per ton, according to strength; 20s. less for contracts.
SODA CRYSTALS.—£5 to £5 5s. per ton ex railway depots or ports.
SODIUM ACETATE 97/98%.—£21 per ton.
SODIUM BICARBONATE.—£10 10s. per ton, cart. paid.
SODIUM BICHROMATE.—3½d. per lb.
SODIUM BISULPHITE POWDER 60/62%.—£17 per ton for home market, 1-cwt. iron drums included.
SODIUM CHLORATE.—3d. per lb.
SODIUM NITRITE, 100% BASIS.—£27 per ton d/d.
SODIUM PHOSPHATE.—£14 per ton, f.o.r. London, casks free.
SODIUM SULPHATE (GLAUBER SALTS).—£3 12s. 6d. per ton.
SODIUM SULPHIDE CONC. SOLID, 60/65.—£13 5s. per ton d/d. Contract, £13. Cart. paid.
SODIUM SULPHIDE CRYSTALS.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Cart. paid.
SODIUM SULPHITE, PEA CRYSTALS.—£14 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

ACID CARBOLIC CRYSTALS.—4½d. to 5d. per lb. Crude 60's, 1s. 4d. to 1s. 5d.
ACID CRESYLIC 97/99.—2s. to 2s. 2d. per gall. Pale, 95%, 1s. 10d. to 2s. per gall. Dark, 1s. 9d. to 1s. 10d. per gall. Steady.
ANTHRACENE.—A quality, 2½d. to 3d. per unit.
ANTHRACENE OIL, STRAINED.—8d. to 8½d. per gall. Unstrained, 7½d. to 8d. per gall.
BENZOL.—Crude 65's, 1s. 4d. to 1s. 5d. per gall., ex works in tank wagons. Standard Motor, 2s. to 2s. 3d. per gall., ex works in tank wagons. Pure, 2s. 3d. to 3s. 3d. per gall., ex works in tank wagons.
TOLUOL.—90%, 2s. to 3s. per gall. Pure, 2s. 3d. to 3s. 3d. per gall.
XYLOL.—2s. 4d. to 3s. 6d. per gall. Pure, 4s. per gall.
CREOSOTE.—Cresylic, 20/24%, 10d. per gall. Standard specification, middle oil, 6½d. to 7½d. per gall. Heavy, 7½d. to 7½d. per gall.
NAPHTHA.—Crude, 10d. to 1s. 1d. per gall. according to quality. Solvent 90/160, 1s. 8d. to 2s. 3d. per gall. Solvent 90/190, 1s. 3½d. to 1s. 6d. per gall.
NAPHTHALENE CRUDE.—Drained Creosote Salts, £3 10s. to £5 per ton. Whizzed or hot pressed, £5 10s. to £7 10s.
NAPHTHALENE.—Crystals and Flaked, £11 10s. to £13 per ton, according to districts.
PTCH.—Medium soft, 85s. to 95s. per ton.
PYRIDINE.—90/140, 17s. to 20s. per gall. Heavy, 7s. to 10s. per gall.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated.

ACID AMIDONAPHTHOL DISULPHO (1-8-2-4).—10s. 9d. per lb.
ACID ANTHRANILIC.—6s. 6d. per lb. 100%.
ACID BENZOIC.—1s. 9d. per lb.
ACID GAMMA.—8s. per lb.
ACID H.—3s. 3d. per lb. 100% basis d/d.
ACID NAPHTHIONIC.—2s. 2d. per lb. 100% basis d/d.
ACID NEVILLE AND WINTHER.—4s. 9d. per lb. 100% basis d/d.
ACID SULPHANILIC.—9d. per lb. 100% basis d/d.
ANILINE OIL.—9½d. per lb. naked at works.
ANILINE SALTS.—9½d. to 7½d. per lb. naked at works.
BENZALDEHYDE.—2s. 1d. per lb.
BENZIDINE BASE.—3s. 3d. per lb. 100% basis d/d.
o-CRESOL 29/31° C.—3d. to 3½d. per lb.
m-CRESOL 98/100%.—2s. 1d. to 2s. 3d. per lb.
p-CRESOL 32/34° C.—2s. 1d. to 2s. 3d. per lb.
DICHLORANILINE.—2s. 3d. per lb.
DIMETHYLANILINE.—1s. 11d. to 2s. per lb. d/d. Drums extra.
DINITROBENZENE.—9d. per lb. naked at works.
DINITROCHLOROBENZENE.—£84 per ton d/d.
DINITROTOLUENE.—48/50° C. 8d. per lb. naked at works. 66/68° C., 9d. per lb. naked at works.
DIPHENYLANILINE.—2s. 10d. per lb. d/d.
o-NAPHTHOL.—2s. per lb. d/d.
B-NAPHTHOL.—11d. to 1s. per lb. d/d.
o-NAPHTHYLAMINE.—1s. 3d. per lb. d/d.
B-NAPHTHYLAMINE.—3s. 2d. per lb. d/d.
o-NITRANILINE.—5s. 9d. per lb.
m-NITRANILINE.—3s. 3d. per lb. d/d.
p-NITRANILINE.—1s. 9d. per lb. d/d.
NITROBENZENE.—7d. per lb. naked at works.
NITRONAPHTHALENE.—10d. per lb. d/d.
R. SALT.—2s. 4d. per lb. 100% basis d/d.
SODIUM NAPHTHIONATE.—1s. 9d. per lb. 100% basis d/d.
o-TOLUIDINE.—9d. per lb. naked at works.
p-TOLUIDINE.—2s. 2d. per lb. naked at works.
m-XYLIDINE ACETATE.—2s. 11d. per lb. 100%.

Wood Distillation Products

ACETATE OF LIME.—Brown, £8. Grey, £17 10s. per ton. Liquor, 9d. per gall. 32° Tw.
CHARCOAL.—£7 to £9 per ton, according to grade and locality.
IRON LIQUOR.—1s. 6d. per gall. 32° Tw. 1s. 2d. per gall., 24° Tw.
RED LIQUOR.—9½d. to 1s. per gall.
WOOD CREOSOTE.—2s. 9d. per gall. Unrefined.
WOOD NAPHTHA, MISCIBLE.—3s. 6d. per gall. 60% O.P. Solvent, 3s. 6d. per gall. 40% O.P.
WOOD TAR.—£3 to £5 per ton, according to grade.
BROWN SUGAR OF LEAD.—£39 to £40 per ton.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 6d. to 1s. 5d. per lb., according to quality, Crimson, 1s. 3d. to 1s. 7½d. per lb., according to quality.
ARSENIC SULPHIDE, YELLOW.—2s. per lb.
BARYTES.—£3 10s. to £6 15s. per ton, according to quality.
CADMIUM SULPHIDE.—2s. 9d. per lb.
CARBON BISULPHIDE.—£20 to £25 per ton, according to quantity.
CARBON BLACK.—5½d. per lb., ex wharf.
CARBON TETRACHLORIDE.—£46 to £55 per ton, according to quantity, drums extra.
CHROMIUM OXIDE, GREEN.—1s. 2d. per lb.
DIPHENYLGUANIDINE.—3s. 9d. per lb.
INDIARUBBER SUBSTITUTES, WHITE AND DARK.—5½d. to 6½d. per lb.
LAMP BLACK.—£35 per ton, barrels free.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE, 30%.—£22 10s. per ton.
MINERAL RUBBER "RUBFRON."—£13 12s. 6d. per ton f.o.r. London.
SULPHUR.—£9 to £11 per ton, according to quality.
SULPHUR CHLORIDE.—4d. per lb., carboys extra.
SULPHUR PRECIP. B.P.—£47 10s. to £50 per ton.
THIOCARBAMIDE.—2s. 6d. to 2s. 9d. per lb. carriage paid.
THIOCARBANILIDE.—2s. 1d. to 2s. 3d. per lb.
VERMILION, PALE OR DEEP.—5s. 3d. per lb.
ZINC SULPHIDE.—1s. 1d. per lb.

Pharmaceutical and Photographic Chemicals

ACID, ACETIC, 80% B.P.—£39 per ton ex wharf London in glass containers.

ACID, ACETYL SALICYLIC.—2s. 4d. to 2s. 6d. per lb. Brisk demand.

ACID, BENZOIC B.P.—2s. to 2s. 3d. per lb., according to quantity.

ACID, BORIC B.P.—Crystal, £43 per ton; Powder, £47 per ton. Carriage paid any station in Great Britain, in ton lots.

ACID, CAMPHORIC.—19s. to 21s. per lb.

ACID, CITRIC.—1s. 3½d. to 1s. 4½d. per lb., less 5%.

ACID, GALLIC.—2s. 8d. per lb. for pure crystal, in cwt. lots.

ACID, PYROGALLIC, CRYSTALS.—7s. 3d. per lb. Resublimed, 8s. 3d.

ACID, SALICYLIC.—1s. 3½d. to 1s. 5½d. per lb. Technical.—10½d. to 11d. per lb.

ACID, TANNIC B.P.—2s. 9d. to 2s. 11d. per lb.

ACID, TARTARIC.—1s. 0½d. per lb., less 5%. Market firm.

AMIDOL.—9s. per lb., d/d.

ACETANILIDE.—1s. 7d. to 1s. 8d. per lb. for quantities.

AMIDOPYRIN.—11s. 6d. per lb.

AMMONIUM BENZOATE.—3s. 3d. to 3s. 6d. per lb., according to quantity.

AMMONIUM CARBONATE B.P.—£37 per ton. Powder, £39 per ton in 5 cwt. casks.

ATROPINE SULPHATE.—11s. per oz. for English make.

BARBITONE.—9s. per lb.

BENZONAPHTHOL.—3s. 3d. per lb. spot.

BISMUTH CARBONATE.—12s. 6d. to 14s. 3d. per lb.

BISMUTH CITRATE.—9s. 6d. to 11s. 3d. per lb.

BISMUTH SALICYLATE.—10s. 3d. to 12s. per lb.

BISMUTH SUBNITRATE.—10s. 9d. to 12s. 6d. per lb. according to quantity.

BORAX B.P.—Crystal, £27; Powder, £28 per ton. Carriage paid any station in Great Britain, in ton lots.

BROMIDES.—Potassium, 1s. 8d. to 1s. 11d. per lb.; sodium, 1s. 10d. to 2s. 2d. per lb.; ammonium, 2s. 1d. to 2s. 3d. per lb., all spot.

CALCIUM LACTATE.—1s. 3d. to 1s. 5d.

CHLORAL HYDRATE.—3s. 3d. to 3s. 6d. per lb., duty paid.

CHLOROFORM.—2s. 3d. to 2s. 7½d. per lb., according to quantity.

CRESOTE CARBONATE.—6s. per lb.

FORMALDEHYDE.—£39 per ton, in barrels ex wharf.

GUAIACOL CARBONATE.—7s. to 7s. 6d. per lb.

HEXAMINE.—2s. 4d. to 2s. 6d. per lb.

HOMATROPINE HYDROBROMIDE.—30s. per oz.

HYDRASTINE HYDROCHLORIDE.—English make offered at 120s. per oz.

HYDROGEN PEROXIDE (12 VOLS.).—1s. 8d. per gallon f.o.r. makers' works, naked.

HYDROQUINONE.—4s. 3d. per lb., in cwt. lots.

HYPOPHOSPHITES.—Calcium, 3s. 6d. per lb., for 28-lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.

IRON AMMONIUM CITRATE B.P.—2s. to 2s. 3d. per lb. Green, 2s. 4d. to 2s. 9d. per lb. U.S.P., 2s. 1d. to 2s. 4d. per lb.

IRON PERCHLORIDE.—20s. to 22s., according to quantity.

MAGNESIUM CARBONATE.—Light Commercial, £31 per ton net.

MAGNESIUM OXIDE.—Light Commercial, £67 10s. per ton, less 2½% price reduced; Heavy Commercial, £22 per ton, less 2½%.

MENTHOL.—A.B.R. recrystallised B.P., 19s. 9d. net per lb., Synthetic, 10s. 6d. to 12s. per lb., according to quality.

MERCURIALS.—Red oxide, 5s. 11d. to 6s. 1d. per lb.; Corrosive sublimate, 4s. 3d. to 4s. 5d. per lb.; white precipitate, 4s. 9d. to 4s. 11d. per lb.; Calomel, 4s. 6d. to 4s. 8d. per lb.

METHYL SALICYLATE.—1s. 4d. to 1s. 7d. per lb.

METHYL SULPHONAL.—16s. 6d. per lb.

METOL.—11s. per lb. British make.

PARAFORMALDEHYDE.—1s. 9d. for 100% powder.

PARALDEHYDE.—1s. 2d. to 1s. 4d. per lb.

PHENACETIN.—3s. 9d. to 4s. per lb.

PHENAZONE.—5s. 9d. to 6s. per lb.

PHENOLPHTHALEIN.—4s. per lb.

POTASSIUM BITARTRATE 99/100% (Cream of Tartar).—81s. per cwt., less 2½% for ton lots.

POTASSIUM CITRATE.—1s. 11d. to 2s. 2d. per lb.

POTASSIUM FERRICYANIDE.—1s. 9d. per lb. in cwt. lots. Quiet.

POTASSIUM IODIDE.—16s. 8d. to 17s. 2d. per lb., according to quantity.

POTASSIUM METABISULPHITE.—6d. per lb., 1-cwt. kegs included, f.o.r. London.

POTASSIUM PERMANGANATE.—B.P. crystals, 6½d. per lb., spot.

QUININE SULPHATE.—1s. 8d. to 1s. 9d. per oz., in 100 oz. tins.

RESORCIN.—4s. 3d. to 4s. 9d. per lb., spot

SACCHARIN.—55s. per lb.

SALOL.—3s. per lb.

SODIUM BENZOATE, B.P.—1s. 10d. to 2s. 2d. per lb.

SODIUM CITRATE, B.P.C., 1911.—1s. 8d. to 1s. 11d. per lb., B.P.C., 1923. 1s. 11d. to 2s. 2d. per lb., according to quantity.

SODIUM FERROCYANIDE.—4d. per lb. carriage paid.

SODIUM HYPOSULPHITE, PHOTOGRAPHIC.—£15 5s. per ton, d/d consignee's station in 1-cwt. kegs.

SODIUM NITROPRUSSIDE.—16s. per lb.

SODIUM POTASSIUM TARTRATE (ROCHELLE SALT).—75s. to 80s. per cwt., according to quantity.

SODIUM SALICYLATE.—Powder, 1s. 9d. to 1s. 10d. per lb. Crystal, 1s. 10d. to 1s. 11d. per lb.

SODIUM SULPHIDE, PURE RECRYSTALLISED.—10d. to 1s. 2d. per lb.

SODIUM SULPHITE, ANHYDROUS, £27 10s. to £28 10s. per ton, according to quantity; 1-cwt. kegs included.

SULPHONAL.—10s. 6d. per lb.

TARTAR EMETIC, B.P.—Crystal or Powder, 1s. 11d. to 2s. per lb.

THYMOL.—11s. 6d. to 13s. 9d. per lb.

Perfumery Chemicals

ACETOPHENONE.—10s. per lb.

AUBEPINE (EX ANETHOL).—10s. 9d. per lb.

AMYL ACETATE.—2s. per lb.

AMYL BUTYRATE.—5s. 6d. per lb.

AMYL SALICYLATE.—3s. 3d. per lb.

ANETHOL (M.P. 21/22° C.).—6s. per lb.

BENZYL ACETATE FROM CHLORINE-FREE BENZYL ALCOHOL.—2s. 1d. per lb.

BENZYL ALCOHOL FREE FROM CHLORINE.—2s. 1d. per lb.

BENZALDEHYDE FREE FROM CHLORINE.—2s. 7d. per lb.

BENZYL BENZOATE.—2s. 4d. per lb.

CINNAMIC ALDEHYDE NATURAL.—17s. 9d. per lb.

COUMARIN.—11s. 6d. per lb.

CITRONELLOL.—15s. per lb.

CITRAL.—9s. 6d. per lb.

ETHYL CINNAMATE.—10s. per lb.

ETHYL PHTHALATE.—3s. per lb.

EUGENOL.—10s. per lb.

GERANIOL (PALMAROSA).—10s. per lb.

GERANIOL.—6s. 3d. to 10s. 6d. per lb.

HELIOTROPINE.—5s. per lb.

ISO EUGENOL.—14s. 6d. per lb.

LINALOL.—12s. to 17s. per lb.

LINALYL ACETATE.—15s. to 18s. 6d. per lb.

METHYL ANTHRANILATE.—9s. 3d. per lb.

METHYL BENZOATE.—5s. per lb.

MUSK KETONE.—34s. per lb.

MUSK XYLOL.—8s. 3d. per lb.

NEROLIN.—3s. 9d. per lb.

PHENYL ETHYL ACETATE.—12s. per lb.

PHENYL ETHYL ALCOHOL.—9s. 3d. per lb.

RHODINOL.—28s. 6d. per lb.

SAPROL.—1s. 6d. per lb.

TERPINEOL.—1s. 6d. per lb.

VANILLIN.—20s. 6d. per lb.

Essential Oils

ALMOND OIL.—11s. 6d. per lb.

ANISE OIL.—3s. 3d. per lb.

BERGAMOT OIL.—27s. per lb.

BOURBON GERANIUM OIL.—13s. 3d. per lb.

CAMPHOR OIL.—67s. 6d. per cwt

CANANGA OIL, JAVA.—20s. per lb.

CINNAMON OIL, LEAF.—6d. per oz.

CASSIA OIL, 80/85%.—9s. 3d. per lb.

CITRONELLA OIL.—Java, 85/90%, 2s. 7d. Ceylon, 2s. per lb.

CLOVE OIL.—7s. per lb.

EUCALYPTUS OIL, 70/75%.—2s. per lb.

LAVENDER OIL.—French 38/40%, Esters, 17s. per lb.

LEMON OIL.—9s. per lb.

LEMONGRASS OIL.—4s. 6d. per lb.

ORANGE OIL, SWEET.—10s. 9d. per lb.

OTTO OF ROSE OIL.—Bulgarian, 70s. per oz. Anatolian, 30s. per oz.

PALMA ROSA OIL.—9s. 9d. per lb.

PEPPERMINT OIL.—Wayne County, 57s. 6d. per lb. Japanese, 11s. 9d. per lb.

PETITGRAIN OIL.—9s. per lb.

SANDAL WOOD OIL.—Mysore, 26s. per lb. Australian, 17s. 3d. per lb.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.

London, August 26.

THERE has been a fair demand during the past week for a number of products and with the reopening of many works after their usual annual holiday and the better outlook in the coal dispute, the demand is expected to enlarge considerably. One or two products are inclined to be in short supply for near delivery, consequent upon a greatly increased export demand which has arisen and caused makers to be fully sold.

Prices continue steady with one or two exceptions. The export demand from some markets has livened up considerably of late.

General Chemicals

ACETONE.—The price continues unsteady, and the forward position at the moment is uncertain. Demand meanwhile is naturally restricted to immediate wants.

ACID ACETIC.—A fair demand is being received and prices rule steady, as has been the case for some time.

ACID FORMIC.—Firm, although demand is only for small lots; stocks are not heavy, however.

ACID LACTIC.—Satisfactory business is reported in this acid which continues to be quoted at £43, for 50 % weight technical.

ACID OXALIC.—Demand still far below normal, although the price is now steady at 3½d. to 3¾d. per lb.

ACID TARTARIC.—Price a shade firmer at 11¼d., with demand slightly better than of late.

ALUMINA SULPHATE is improving in demand and the price is inclined to be firmer for forward delivery.

AMMONIUM CHLORIDE.—Without much interest being shown, and the price lags at £19 10s. to £20.

ARSENIC.—Only a small home demand at about £14 10s. to £14 15s.; export trade is practically non-existent.

BARIUM CHLORIDE is in better supply and the price is steady at £10 warehouse.

COPPER SULPHATE is quoted higher, with a fair amount of inquiry on the market. Continental material offering at about £22 15s.

EPSOM SALTS.—A fair trade is being done at unchanged rates.

FORMALDEHYDE.—Demand continues small, with the price now extremely steady at about £31.

IRON SULPHATE.—Heavy export demand with supplies difficult to obtain.

LEAD ACETATE.—No change in price, with a satisfactory and increasing demand. Price for white quality, £46 10s.; brown, £43.

METHYL ACETONE.—Steady with a fair demand for small quantities.

METHYL ALCOHOL.—Unchanged.

POTASSIUM CHLORATE.—In good request for export account, and the price holds steady in this country at about £31 to £32, according to quantity.

POTASSIUM PERMANGANATE displays a slightly firmer tendency and demand is improving.

POTASSIUM PRUSSATE is in fair request with small stocks offering at 7d.

SODA ACETATE.—Supply is more adequate for the present demand, and the price steady for spot at about £21.

SODA BICHROMATE.—A fair trade is passing at 3½d. lb., with slightly lower prices for large quantities of imported makes to arrive.

SODA HYPOSULPHITE.—Quite a heavy demand has been experienced for the commercial grade, especially on export account, and a little difficulty is found in obtaining large supplies for prompt delivery. The price is tending firmer, as some of the continental works are fully sold.

SODA NITRITE.—A small trade is offering at £20 10s. to £21.

SODA PHOSPHATE.—The price is firmer with an improving demand.

SODA PRUSSATE.—Demand is low, but the price remains exceedingly steady at 3½d. to 4d., according to quantity and delivery.

SODA SULPHIDE is firmer, with a larger demand from some directions. Continental prices are inclined to be higher.

ZINC SULPHATE.—Firm, with stocks light and demand fair.

Coal Tar Products

Owing to the continuance of the coal strike, prices quoted are in all cases more or less nominal.

90's BENZOL.—Quotations are only obtainable for Continental material, and the price asked is 2s. 2d. per gallon, f.o.b. Continental port, naked.

PURE BENZOL is unobtainable.

CREOSOTE OIL.—Supplies are becoming exceedingly scarce, and only very small quantities are obtainable: the price on rails in the provinces is 7½d. per gallon, while the price in London for spot parcels is 7¾d. per gallon, at maker's works.

CRESYLIC ACID.—The pale quality, 97/99%, is worth about 2s. 2d. per gallon on rails, while the dark quality, 95/97%, is worth about 2s. to 2s. 1d. per gallon.

SOLVENT NAPHTHA is worth 1s. 10d. on rails, and only small supplies are available.

HEAVY NAPHTHA is worth 1s. 4d. to 1s. 5d. per gallon on rails.

NAPHTHALENES.—The 76/78 quality is worth about £6 15s. per ton and the 74/76 quality about £6 per ton, at maker's works.

Latest Oil Prices

LONDON.—**LINSEED OIL** firm and in good request at about 10s. over last rates. Spot, £33 15s., ex mill; August, £32 12s. 6d.; September, £32 15s.; September-December, £33; January-April, £33 10s. **COTTON OIL** quiet and unaltered. Refined common edible, £44; Egyptian crude, £38; deodorised, £46. **RAPE OIL** slow. Chinese, crude, August-September, £44, drums; Japanese, £44, barrels. **TURPENTINE** firm at 3d. to 6d. advance per cwt. Spot (American), 65s. 6d.; September-December, 66s. 9d.; and January-April, 68s. 9d.

HULL.—**LINSEED OIL.** Naked, spot to January-April, £33 2s. 6d. **COTTON OIL.**—Naked, Bombay crude, £34 10s.; Egyptian crude, £35 10s.; edible, refined, £41; technical, £37 15s. **PALM KERNEL OIL.**—Crushed, naked, 5½ per cent., £41. **GROUNDNUT OIL.**—Crushed-extracted, £43 10s.; deodorised, £47 10s. **SOYA OIL.**—Extracted and crushed, £37 5s.; deodorised, £40 15s. **RAPE OIL.**—Crude-extracted, £47 10s.; refined, £49 10s. per ton, net cash terms, ex mill. **CASTOR OIL.**—Unchanged. **COD OIL.**—31s. 6d. per cwt. barrels.

Nitrogen Products

Export.—As usual August is a very quiet month; no doubt quieter than ever this year, because it is well known that British producers have only small quantities available for prompt shipment. These are being sold on the basis of £10 15s. per ton f.o.b. U.K. port in single bags. The position on the Continent and the United States appears to be unchanged.

Home.—The announcement of home prices for delivery up to the end of May has resulted in considerable forward bookings. Many buyers appear anxious to cover their seasonal requirements to ensure that their customers will not be disappointed. General satisfaction is expressed at the new nitrogen basis on which sulphate is being sold.

Nitrate of Soda.—The nitrate market remains featureless. Bookings are smaller than usual even in the United States. Reported offerings from the Continent at prices below the Producers' Association scale prices have tended to accentuate the holding off of buyers. The demand from consumers at the end of the year will, however, soon enforce buying on a scale which will be sufficient for their requirements.

Calcium Cyanamide

The recent announcement of the new season's prices for calcium cyanamide has resulted in an increased interest in this material. At the figure already published, £9 2s. per ton for 4 ton lots, August delivery, carriage paid to any railway station in Great Britain, the unit of nitrogen costs just under 9s. 7d. as compared with 10s. 6d. per unit at the commencement of the 1925-6 season.

Death from Potassium Cyanide Fumes

At the inquest on Thursday, August 19, at Lincoln, on Tom Ward, aged 64, an engineer of Cecil Street, Lincoln, the danger attending the fumigation of plants with poisonous substances was referred to. On Monday afternoon Ward was fumigating plants in his greenhouse to kill "fly." His method was to use a spirit lamp, placing in it a cake of cyanide of potassium, and leaving the lamp in the greenhouse. In the evening Mrs. Ward found her husband suffering from sickness and called in a doctor, but Ward died two days after. William Harby, chemist, giving evidence, said that Ward purchased the cyanide of potassium from him. The usual course was to dissolve it in water for spraying. If put in a lamp it would give off cyanide vapour, which would be intensely dangerous. Medical evidence supported the theory that Ward had inhaled cyanide of potassium fumes.

A verdict of "Death from misadventure" was recorded.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to THE CHEMICAL AGE by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, August 25, 1926.

THERE is little change in the state of the chemical market this week, which remains still quiet, prices generally being steady.

Industrial Chemicals

ACID ACETIC, 98/100%.—£55 to £67 per ton, according to quality and packing, c.i.f. U.K. port; 80% pure, £39 to £41 per ton; 80% technical, £38 to £39 per ton, c.i.f. U.K. ports.

ACID, BORIC.—Crystal, granulated or small flakes, £37 per ton; powdered, £39 per ton, packed in bags, carriage paid U.K. stations.

ACID, CARBOLIC, ICE CRYSTALS.—In moderate demand and price unchanged at 4½d. per lb., delivered or f.o.b. U.K. ports.

ACID, CITRIC, B.P. CRYSTALS.—Quoted 1s. 3½d. per lb., less 5% ex store. Offered for prompt shipment at a fraction less.

ACID, FORMIC, 85%.—Continental offers are higher. Now quoted £52 per ton, c.i.f. U.K. ports. Spot material offered at about £54 10s. per ton, ex store.

ACID HYDROCHLORIC.—In little demand. Price 6s. 6d. per carboy, ex works.

ACID NITRIC, 80%.—Usual steady demand and price unchanged at £23 5s. per ton, ex station, full truck loads.

ACID OXALIC, 98/100%.—Remains unchanged at about 3½d. per lb., ex store. Offered for early delivery from the Continent at 3½d. per lb., ex wharf.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Spot material now on offer at 11½d. per lb., less 5%, ex store. The same price named for prompt shipment, but could be done at a fraction less.

ALUMINA SULPHATE, 17/18%, IRON FREE.—On offer from the continent at about £5 8s. 6d. per ton, c.i.f. U.K. ports. Spot material quoted £6 5s. per ton, ex store.

ALUM, LUMP POTASH.—Spot material quoted £9 5s. per ton, ex store. On offer from the continent at about £7 17s. 6d. per ton, c.i.f. U.K. ports. Crystal powdered quoted £7 12s. 6d., c.i.f. U.K. ports. Spot material on offer at £8 7s. 6d. per ton, ex store.

AMMONIA ANHYDROUS.—Imported material selling at about 11½d. to 11¼d. per lb., ex wharf, containers extra and returnable.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton, packed in 5 cwt. casks, delivered or f.o.b. U.K. ports.

AMMONIA LIQUID, 880°.—Unchanged at about 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals of British manufacture quoted £23 10s. to £25 10s. per ton, ex station. Continental on offer at about £21 10s. per ton, c.i.f. U.K. ports. Fine white crystals of continental manufacture quoted £18 5s. per ton, c.i.f. U.K. ports.

ARSENIC, WHITE POWDERED.—In little demand, spot material quoted £16 5s. per ton, ex store. Offered to come forward at about £15 10s. per ton, ex wharf.

BARIUM CARBONATE, 98/100%.—White powdered quality quoted £6 15s. per ton, c.i.f. U.K. ports.

BARIUM CHLORIDE.—Spot material now on offer at about £9 15s. per ton, ex store. Quoted £8 15s. per ton, c.i.f. U.K. ports, prompt shipment.

BLEACHING POWDER.—English material unchanged at £9 10s. per ton, ex station; contracts 20s. per ton less. Continental now quoted £7 15s. per ton, c.i.f. U.K. port.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. ports.

BORAX.—Granulated, £22 10s. per ton; crystals, £23 per ton; powdered, £24 per ton, carriage paid U.K. stations.

CALCIUM CHLORIDE.—English manufacturer's price unchanged at £5 12s. 6d. to £5 17s. 6d. per ton, ex station. Continental also unchanged at about £3 15s. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—Unchanged at about £3 10s. per ton, f.o.b. works, or £4 2s. 6d. per ton, f.o.b. U.K. port, for export.

COPPER, SULPHATE, 99/100%.—Continental material on offer at about £22 10s. per ton, ex wharf. English material for export quoted £23 5s. per ton, f.o.b. U.K. ports.

FORMALDEHYDE, 40%.—Spot material quoted £40 per ton, ex store. Quoted £39 per ton, c.i.f. U.K. ports, early shipment.

GLAUBER SALTS.—English material unchanged at £4 per ton, ex store or station. Continental quoted £2 17s. 6d. per ton, c.i.f. U.K. ports.

LEAD, RED.—Imported material on offer at £39 per ton, ex store.

LEAD, WHITE.—Now quoted £39 10s. per ton, ex store.

LEAD, ACETATE.—White crystals quoted £45 per ton, c.i.f. U.K. ports, prompt shipment. Brown about £40 10s. per ton, c.i.f. U.K. ports.

MAGNESITE, GROUND CALCINED.—Quoted £8 10s. per ton, ex store, in moderate demand.

POTASH, CAUSTIC, 88/92%.—Syndicate prices vary from £25 10s. to £28 15s. per ton, c.i.f. U.K. ports, according to quantity and destination. Spot material available at about £29 per ton.

POTASSIUM BICHROMATE.—Unchanged at 4½d. per lb., delivered.

POTASSIUM CARBONATE, 96/98%.—Quoted £25 5s. per ton, ex wharf, early delivery. Spot material on offer at £26 10s. per ton, ex store. 90/94% quality quoted £22 5s. per ton, c.i.f. U.K. ports.

POTASSIUM CHLORATE, 98/100%.—Powdered on offer at £26 15s. per ton, c.i.f. U.K. ports. Crystals, £28 per ton, c.i.f. U.K. ports.

POTASSIUM NITRATE (SALTPETRE).—Unchanged at about £22 5s. per ton, c.i.f. U.K. ports, spot material available at £24 10s. per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Quoted 7½d. per lb., ex store, spot delivery. To come forward 7d. per lb., ex wharf.

POTASSIUM PRUSSIAN, YELLOW.—Spot material a trifle dearer at 7½d. per lb., ex wharf. Quoted 6½d. per lb., c.i.f. U.K. ports to come forward.

SODA CAUSTIC, 76/77%, £17 10s. per ton; 70/72%, £16 2s. 6d. per ton; broken, 60%, £16 12s. 6d. per ton; powdered, 98/99%, £20 17s. 6d. per ton. All carriage paid U.K. stations, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—English material quoted £22 per ton, ex station. Continental on offer at about £20 10s. per ton, ex store, or to come forward £19 15s. per ton, c.i.f. U.K. ports.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM BICHROMATE.—English price unchanged at 3½d. per lb., delivered.

SODIUM CARBONATE (SODA CRYSTALS).—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality, £1 7s. 6d. per ton more. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—Large crystals of English manufacture quoted £9 per ton, ex station, minimum 4 ton lots. Pea crystals £14 10s. per ton, ex station. Continental commercial on offer at about £7 15s. per ton, c.i.f. U.K. ports.

SODIUM NITRATE.—Quoted £13 per ton, ex store; 96/98% refined quality 7s. 6d. per ton extra.

SODIUM NITRITE, 100%.—Quoted £24 per ton, ex store. Offered from the continent at about £22 5s. per ton, c.i.f. U.K. ports.

SODIUM PRUSSIAN, YELLOW.—Spot material now quoted 3½d. per lb., ex store. Offered for early shipment from the continent at 3½d. per lb., ex wharf.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption, £3 10s. per ton, ex works. Good enquiry for export and higher prices obtainable.

SODIUM SULPHIDE, 60/62%.—Solid, £13 5s. per ton; broken, £14 5s. per ton; flake, £15 5s. per ton; crystals, 31/34%, £8 12s. 6d. per ton. All delivered buyers works U.K., minimum 5 ton lots with slight reduction for contracts; 60/62% solid quality offered from the continent at about £9 per ton, c.i.f. U.K. ports; broken quality, 15s. per ton more; crystals, 30/32%, about £6 15s. per ton, c.i.f. U.K. ports.

SULPHUR.—Flowers, £11 10s. per ton; roll, £10 5s. per ton; rock, £10 5s. per ton; floristella, £9 15s. per ton; ground American, £9 per ton; ex store, spot delivery; prices nominal.

ZINC CHLORIDE.—British material, 96/98%, quoted £23 15s. per ton, f.o.b. U.K. ports; 98/100%, solid, on offer from the continent at about £21 15s. per ton, c.i.f. U.K. ports; powdered, 20s. per ton extra.

ZINC SULPHATE.—Continental make on offer at about £11 per ton, ex wharf.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Increased Production of Phosphate Rock

THE total quantity and value of phosphate rock mined in the United States and sold in 1925 were 3,481,819 long tons, valued at \$11,545,678. The figures indicate an increase of 21 per cent. in quantity and of 13 per cent. in value as compared with 1924. Imports of phosphate rock in 1925, which were 2,735 long tons, valued at \$37,932, indicated a decrease of 83 per cent. in quantity and of 79 per cent. in value. Exports amounted to 922,655 long tons, valued at \$6,559,360, an increase of 13 per cent. in quantity and 28 per cent. in value.

Manchester Chemical Market

(FROM OUR OWN CORRESPONDENT.)

MANCHESTER, August 26, 1926.

RATHER more price shading than has been experienced on the Manchester chemical market for some months has to be reported this week, although in most instances the changes are no more than fractional. Most of the alkali products keep very firm and in the case of soda ash there has been a rise of 5s. per ton during the past week. Home demand remains restricted and buyers are still operating with a good deal of caution. Export trade, also, is on quiet lines, Continental business in particular being quiet.

Heavy Chemicals

There is only a limited call for phosphate of soda and prices are easy at £12 5s. to £12 10s. per ton. Similar conditions characterise the market for sulphide of soda, although there is little change in values to record, 60-65 per cent. concentrated solid offering at £10 5s. to £10 10s. per ton and commercial crystals at £8 5s. Bleaching powder meets with a quietly steady demand at round £8 10s. per ton. Alkali, 58 per cent. material, continues to sell in moderate quantities and prices are firmer at £7 per ton. Saltcake is dull although about unchanged at £3 5s. per ton, glauber salts also attracting little attention from buyers at £3 15s. Caustic soda keeps firm and meets with a fair demand at £17 10s. per ton for 76 per cent. strength down to £15 2s. 6d. per ton for 60 per cent. strength. Hyposulphite of soda is about maintained but there is only a quiet trade in this passing at the moment; photographic quality is offered at about £15 10s. per ton and commercial at £9 10s. Acetate of soda is still quoted at from £20 to £21 per ton but the demand remains rather quiet. Bicarbonate of soda is unchanged at £10 10s. per ton. Bichromate of soda is well held at 3½d. per lb., a quietly steady business being done. Prussiate of soda is on the easy side although little changed since last week, current quotations being about 3½d. per lb. Nitrite of soda is in limited request at £20 per ton. Chlorate of soda is maintained at 3½d. to 3¾d. per lb., but sales are slow.

Only a quiet trade is passing in permanganate of potash, with B.P. quality on offer at 6¾d. to 7d. per lb. and commercial at about 5½d. Caustic potash continues to sell in fair quantities and prices are steady and unchanged at £27 per ton. Carbonate of potash is in moderate demand at about £26 5s. per ton. Yellow prussiate of potash is rather quiet and values have an easy tendency at 6¾d. per lb. Chlorate of potash is quoted at 3¾d. per lb., with demand poor. Bichromate of potash is steady although not particularly active at 4d. to 4½d. per lb.

Arsenic is still moving off in limited quantities and values are easy at £13 5s. to £13 10s. per ton, on rails, for white powdered, Cornish makes. Sulphate of copper is in moderate request and fairly steady at about £23 5s. per ton, f.o.b. The lead compounds keep up pretty well, although there is not a great deal of business passing in these. Acetate of lead is now being quoted at up to £47 per ton for white and £42 for brown. Nitrate of lead is about unchanged at £41 per ton. Grey acetate of lime is slow but steady at £17 10s to £18 per ton, and brown at £8.

Acids and Tar Products

Tartaric acid is still being offered at 11¾d. per lb., but demand remains quiet. Citric acid is quiet and rather easy at 1s. 3¾d. to 1s. 3½d. per lb. There has been little call for oxalic acid this week, but prices, although weak, are unchanged at 3½d. per lb. Acetic acid keeps steady and in moderate request at £38 per ton for 80 per cent. commercial quality and about £67 per ton for glacial.

With supplies of most of the coal-tar products scarce values are nominal although firm. For pitch, up to 95s. per ton, f.o.b., is being quoted, with creosote oil at 7¾d. per gallon, solvent naphtha at 1s. 11d. per gallon, cresylic acid about 2s. per gallon, and toluol between 1s. 11d. and 2s. per gallon.

Use of Artificial Fertilisers

THERE has appeared the second (September) number of *Crops and Grasslands*, a monthly journal of fertiliser information issued by Fertiliser Sales, Ltd., of Adelaide House, King William Street, London. It contains articles on "Cyanamide for Winter Crops," "Soil Action of Cyanamide," etc.

Tariff Changes

IRAQ.—The Government *Gazette* of June 15 contains copy of a Government notification regarding the manufacture, the importation into and the exportation from Iraq of dangerous drugs, which has been issued in accordance with the requirements of the International Opium Convention, 1925. The notification prohibits the importation of medicinal opium, morphine, Indian hemp and other enumerated substances, unless a separate import authorisation has previously been obtained for each such importation from the Director of Public Health. The exportation of the substances enumerated in the notification is prohibited unless a separate export authorisation has previously been obtained for each such exportation from the Director of Public Health. The notification also provides for the control of the manufacture and the transit of the drugs in question.

UNITED KINGDOM.—Amorphous carbon electrodes (not including primary battery carbons or arc lamp carbons); molybdenum, ferro-molybdenum and molybdenum compounds, and vanadium, ferro-vanadium and vandium compounds (not including ores or minerals of molybdenum or vanadium) are to be brought within the charge of the Key Industry Duty. The rate of duty is one-third of the value of these goods.

The rates of drawback on certain descriptions of waste resulting from the manufacture of artificial silk articles produced in Great Britain and Northern Ireland and additional to those shown in Part II (1) of the Second Schedule to the Finance Act, 1925, are also announced. The drawback for artificial silk waste, prepared for spinning, including tops, is at the rate of 6d. the lb.

AUSTRIA.—The "General" Customs Duties Bill has now been passed into law (dated July 28) and came into force on August 11. It affects duties on stearic acid, oleic acid, kaolin, lignite and schist tar oils, benzene, ceresine, zinc and ferro-cyanide colours, glycerine, artificial silk, etc.

BELGIUM.—A Decree dated August 6, and effective from August 8, withdraws the requirement of a licence for the import of mineral fuel including lignite and lignite briquettes coming from Germany or Holland.

FRANCE.—A tax on liquid carbonic acid, which was fixed at 15 frs. per kilog, has been reduced to 8 fr. per kilog by a further law of August 9.

GERMANY.—Reduced duties on certain French goods provided for by the Provisional Commercial Agreement between France and Germany will also apply to similar goods of United Kingdom origin and production, in virtue of the provisions of the Anglo-German Treaty of Commerce and Navigation. The reduced duties include those on certain soaps, artificial silk, etc.

ITALY.—A Decree-Law dated July 1 provides that artificial silk yarn measuring 60,000 metres or more per ½ kilog may be imported into Italy duty free, under the "temporary importation" regulations. This is a provisional concession valid for a year.

PORTUGAL.—Decree No. 12,048 prescribes revised rates of duty to glue, olive oil, calcium phosphates and carbide, etc. The note in Tariff No. 493 classifying olive oil with an acidity of 5 degrees under Tariff No. 89 and prohibiting the import of such oil unless denatured is deleted. Export duties modified include those on kaolin and pyrites.

ROUMANIA.—Nitric silver, mercury and electric lamps of lead, zinc and brass alloy may be exported free and are also exempt from commission tax.

SPAIN.—The translation of a Royal Order of August 6 laying down regulations to give effect to the provisions for the protection and development of the Spanish metal industry is now available.

Corrosion of Metals

THE June number of the German journal *Korrosion und Metallschutz* (Corrosion and Metal Protection) contains the following articles: "Experiments on the Exact Determination of Corrosion by Chemical Agents on Steels," by V. Duffek; "Investigation of a Brass Condenser Tube with Peculiar Corrosion," by M. von Schwarz; "On the Action of Sulphurous Acid on Colour Skins," by H. Wolf and G. Zeidler; "The Morphology of Pigments," by A. V. Blom; and "Method and Apparatus for Regulation of Standard Flow of Sand in the Cocks of Sand Blast Apparatus," by H. R. Karg.

Company News

PINCHIN, JOHNSON AND CO., LTD.—The directors have resolved to declare an interim dividend of 10 per cent. actual, less tax, payable on September 1.

JOHN OAKLEY AND SONS.—An interim dividend on the ordinary shares for the half-year ended June 30 of 2½ per cent., less tax, is payable on September 1.

UNITED TURKEY RED CO., LTD.—In view of the abnormal conditions at present prevailing, the directors have decided to defer consideration of a dividend until the end of the financial year.

F. STEINER AND CO., LTD.—After charging £64,423 for repairs and depreciation, a loss of £110,124 is shown for the year ended July 31. The directors have transferred from general and revenue reserves £150,000. After payment of debenture interest and preference dividend and deducting the year's loss, the balance of £30,112 is carried forward to next year.

CALICO PRINTERS' ASSOCIATION.—After providing £511,960 for maintenance, depreciation, repairs, renewals, and upkeep and £128,000 for debenture interest, the accounts for the year ended June 30 show a net profit of £216,218, making with £216,504 brought in, a total credit of £432,722. The directors recommend a dividend on the ordinary shares for the year at the rate of 7½ per cent., less tax, leaving £131,112 to be carried forward.

UNITED INDIGO AND CHEMICAL CO., LTD.—At a meeting of the directors of the company held on August 20, it was decided to recommend payment of the following dividends forthwith: 5 per cent. per annum for the six months ended June 30, 1926, on the ordinary shares, subject to income tax at 4s. in the £; a further dividend of 2½ per cent., less income tax at 4s. in the £ on the ordinary shares, making 7½ per cent. for the year ended June 30 last; also a further dividend of 2½ per cent., less income tax at 4s. in the £, on the preference shares, making 7½ per cent. for the year ended June 30, 1926; and that the transfer books of the company be closed from August 23 to September 1 inclusive. The dividends will be payable on September 3, 1926.

LAFARGE ALUMINOUS CEMENT.—The accounts for the year ended March 31 last show a small loss. After providing for all charges, the loss amounts to £2,650, from which has to be deducted the amount brought forward of £159, leaving a debit balance of £2,491. The report states that the demand for Ciment Fondu is showing a steady and highly satisfactory increase, and good progress has been made in establishing a widespread organisation for distribution. Since the end of the financial year the company has naturally had to face the serious consequences of the general and coal strikes, and although considerable quantities of fuel were obtained before the strike, it has nevertheless been necessary temporarily to close down the works. The board points out that although it is impossible to declare a dividend for the past year, the dividend on the first preference shares is cumulative, and that if future profits come up to expectations, the preference shareholders will not be deprived permanently of their dividends.

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

RED OXIDE PAINT.—The South African Railways and Harbours Administration is inviting tenders for presentation by October 7 for red oxide paint in paste to meet the requirements of the railways during the period January 1, 1927, to December 31, 1927. (Reference B.X. 2,812.)

LINSEED, CASTOR AND COTTON OIL.—A firm of importers and manufacturers' agents in Toronto handling chemicals, soaps and oils, etc., desire to be appointed as agents on a buying basis for a British firm or firms specialising in the production of these oils. (Reference No. 248.)

ANTI-FRICTION GREASE.—The Stores Department of the South African Railways and Harbours Administration invites tenders for presentation by October 7, 1926, for the supply and delivery of approximately 32½ short tons of anti-friction grease to meet the requirements of the administration during the period January 1, 1927, to December 31, 1927. (Reference B.X. 2,813.)

DRY RED LEAD.—The South African Railways and Harbours Administration is calling for tenders for the supply and delivery of genuine red lead, dry. Tenders will be received in South Africa not later than noon on September 23. Firms desiring to offer British-made red lead can obtain further particulars from the Department of Overseas Trade (Room 53). (Reference B.X. 2,814.)

PAINTS AND VARNISHES.—A Wellington firm wishes to obtain the representation of British manufacturers of varnishes, lubricating oils, anti-fouling and copper paints, etc. (Reference No. 251.)

WHITE LEAD OIL PASTE.—The South African Railways and Harbours Administration is calling for tenders for the supply and delivery of genuine white lead oil paste. Tenders will be received in South Africa not later than noon on September 23, 1926. (Reference No. B.X. 2,811.)

PHARMACEUTICAL PRODUCTS.—A chemist in Bratislava desires to secure the representation for Slovakia of a British manufacturer. (Reference No. 254.)

ICE AND SOAP MAKING MACHINERY.—A Syrian commission agent established in Beirut desires to represent British firms interested in Palestine and Syria. (Reference No. 259.)

CHEMICALS.—A commission agent of Sao Paulo (a qualified chemist) desires to secure the representation of a British firm of manufacturing chemists. (Reference No. 264.)

LINSEED OIL AND CHEMICALS.—A commission agent of Rio de Janeiro desires to secure the local representation of British manufacturers. (Reference No. 266.)

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to September 25, 1926.

"SUBTRAX."

469,826.—For chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. Class 1. The firm trading as E. Taeschner Chemisch Pharmazeutische Fabrik, Neue Grunstrasse 4, Berlin, C.19, Germany; manufacturers. May 17, 1926.

"FIBRIT."

471,219.—For chemical substances used in manufactures, photography or philosophical research, and anti-corrosives, but not including vulcanising compounds for repairing tyres, and not including any goods of a like kind to these excluded goods. Class 1. I. G. Farbenindustrie Aktiengesellschaft (a Corporation organised according to German laws), Mainzer Landstrasse 28, Frankfurt-on-Main, Germany; manufacturers. July 6, 1926.

"KENVAR."

471,726.—For chemical substances used in manufactures, photography or philosophical research, and anti-corrosives. Class 1. John H. Fuller and Co., Ltd., 48, Minster Street, Reading, Berkshire; colour grinders, varnish and enamel manufacturers. July 23, 1926. (To be Associated. Sect. 24.)

"VIAMULS."

471,627.—Class 4. For bituminous emulsions for use in manufactures. Viamuls, Ltd., Norway House, 21, Cockspur Street, London, S.W.1; manufacturers. July 20, 1926. (To be Associated. Sect. 24.)

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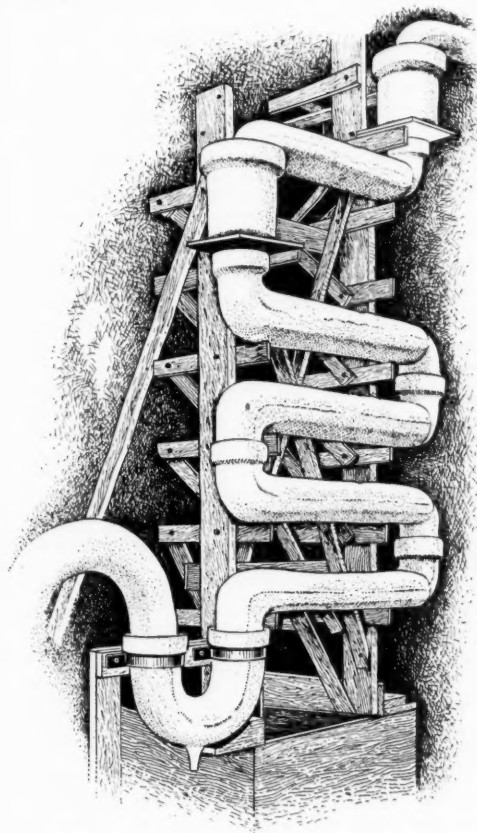
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Telegrams: "Thermal, Wallsend."

ABC Code, 5th and 6th Editions, and Bentley's used.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

SHARPLES AND GILLIARD, Sirtin Works, off Water Street, Accrington, manufacturing chemists. (C.C., 28/8/26.) £16 15s. 11d. July 20th.

Mortgages and Charges

[NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.]

CARR, MACDONALD AND CLEVELY, LTD. (late RECONDITIONING CO., LTD.), London, E., cattle food manufacturers. (M., 28/8/26.) Registered August 9, £4,000 debenture (as to £2,814 2s. 10d., in substitution for debenture dated November 6th, 1920), to H. W. Bear, Ballyvolane, Guildown, Guildford; charged on Britannia Mill, etc., Heathfield, and goodwill of business of millers, etc., carried on there and in London, with plant, etc. *£4,312 10s. July 23, 1925.

MARBLITE, LTD., London, N.W., paint manufacturers. (M., 28/8/26.) Registered August 12, £1,000 debentures; general charge.

MATZKA PRODUCTS (PROPRIETARY CO.), LTD., London, E.C., manufacturing chemists. (M., 28/8/26.) Registered August 10, £1,000 charge, to Pulvo, Ltd., 86, Farringdon Street, E.C.; general charge.

THOMPSON (J. AND J.) AND CO., LTD., Oldham, patent medicine vendors. (M., 28/8/26.) Registered August 5, £3,225 12s. mortgage, to Building Society; charged on 8 and 10, High Street, Oldham. *£33,224 14s. 3d. July 23, 1925.

Satisfactions

SANOPER, LTD., Salford, soap manufacturers. (M.S., 28/8/26.) Satisfaction registered August 10, all moneys etc. registered October 5, 1922.

WESTERN LABORATORIES, LTD., London, W., celluloid manufacturers. (M.S., 28/8/26.) Satisfaction registered August 12, £350, registered July 14, 1923.

London Gazette, &c.

Company Winding Up Voluntarily

PRIMO DRUG CO., LTD. (C.W.U.V., 28/8/26.) S. Hatton, Incorporated Accountant, 14, Brown Street, Manchester, appointed liquidator, July 30.

Notice of Dividend

ARMFIELD, Nathaniel, 124, Usk Road, Battersea, London, manufacturing chemist. First and final dividend, 5½d. per £, payable September 9, Official Receiver, 29, Russell Square, W.C.1.

Partnership Dissolved

PRESTON CORNDALE AND CO. (Anthony John PRESTON, Richard James GIBBS, William DALE, Walter Henry GODFREY and Alfred Ernest GODFREY), manufacturing chemists, 34, Sumner Road, Peckham, Surrey, by mutual consent as from July 17, 1926. Debts received or paid by A. J. Preston, W. Dale and W. H. Godfrey, who continue the business.

Deed of Arrangement

GREY, Herbert and GRANGE, Percival, trading as Valley Mills, Meanwood, Leeds, as B. H. GREY AND SONS, dyers. (D.A., 28/8/26.) Filed August 18th. Trustee, J. H. Birch, 14, Park Row, Leeds, C.A. Liabilities unsecured, £1,459; amounts, less secured claims, £741.

Receivership

EAST MOORS CHEMICAL CO., LTD. (R., 28/8/26.) A. B. Davies, of 7, Oxford Street, Swansea, accountant and auditor, was appointed Receiver and Manager on August 13, 1926, under powers contained in certain debentures.

New Companies Registered

DEKA CO., LTD.—Registered office: 5, Chepstow Street, Manchester. Private co. Registered August 19. Nominal capital, £1,000 in 2,500 founders' shares of 1s. and 875 ordinary shares of £1 each. Manufacturers of and dealers in chemical products, etc. The permanent directors are: T. S. Meldrum, 7, The Mount, Altrincham, Ches. (chairman), P. Allman, H. N. Morris, E. W. Haward, and E. Booth-Baxter.

MONROE CHEMICAL CO., LTD.—Registered office, 46, Holborn Viaduct, E.C.1. Private co. Registered August 21. Nominal capital £1,000 in £1 shares. Manufacturers of and dealers in chemicals, dyestuffs, compounds, paints, pigments, varnishes, drugs, dyewares, etc.

Latest Government Contracts

THE following contracts have been placed recently by the various Government Departments:

Admiralty

(Civil Engineer-in-Chief's Department).

Portsmouth: Portland Cement: The Cement Marketing Co., Ltd., London. H.M. Naval Establishments abroad: Portland Cement: Aberthaw and Bristol Channel Portland Cement Co., Ltd. (T. Beynon and Co., Ltd.), London.

Contract and Purchase Department: Electrodes: Alloy Welding Processes, Ltd., London. Crucible Furnace: Morgan Crucible Co., Ltd., London. Oxygen Producing Plant: G. and J. Weir, Ltd., Glasgow. Separator: Streamline Filter Co., Ltd., London.

War Office

Batteries, Secondary: Chloride Electrical Storage Co., Ltd., Clifton Junction, near Manchester. Lubricating Mineral Oil: Frank How and Co., Ltd., Stratford. Stabilisers and Bismotab: Boots Pure Drug Co., Ltd., Nottingham.

Air Ministry

Accumulators: Chloride Electrical Storage Co., Ltd., London; Edison Swan Electric Co., Ltd., London; Peto and Radford, Ltd., London.

Crown Agents for the Colonies

Air Compressor Plants: Alley and Maclellan, Ltd., Polmadie, Glasgow. Asbestos Cement Tiles, etc.: Bell's Polite and Everite Co., Ltd., London. Candles: Prices Patent Candle Co., London. Cement: The Cement Marketing Co., Ltd., London; T. Beynon and Co., Ltd., London. Coal Tar: Shields and Ramsey, Ltd., Glasgow. Copper Ingots: The Glyco Metal Co., London. Fumigating and Disinfecting Machine: The Clayton Installations, Ltd., London. Paint: T. Smith and Sons, London; Indestructible Paint Co., London. Phosphor Bronze Ingots, etc.: The Phosphor Bronze Co., Ltd., London.

Electrical Melting Point Apparatus

THE electrical melting point apparatus designed by Dr. F. A. Mason is now included in the list of products supplied by A. Gallenkamp and Co., Ltd., of 19 and 21, Sun Street, Finsbury Square, London, E.C.2. The apparatus is suitable for organic substances melting up to 400° C. and the use of sulphuric acid and other objectionable substances is dispensed with.

